

DIET IN DYSPEPSIA

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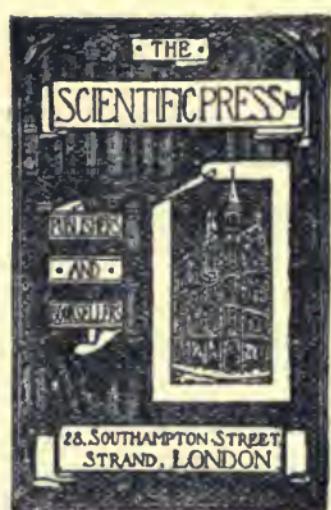
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P R E F A C E

As a nation is made up of individuals which are mutually interdependent, so the human body is made of organs which depend upon the smooth working of each other to establish a harmonious whole. It was Liebig who formerly said that the Tripod of Life consists of the brain, the heart, and the lungs. This may be conceded. But the tripod must have a basis for its support. Surely this consists of the stomach, or rather the alimentary canal of which the stomach is but a specialized portion. The brain, heart and lungs cannot work without energy; and, equally with other parts of the body, these organs will fail in the performance of their functions if they be not supplied with food. The alimentary canal is the laboratory in which is prepared the material to supply the organism with food and its complicated machinery with energy. Therefore, whatever disturbs the "stomach" shakes the foundation on which the vital tripod is supported. Conversely, whatever improves the alimentary func-

tions renders more firm the basis on which the tripod rests.

The following pages, on Diet in Dyspepsia or disturbances of the alimentary functions, consist of a course of lectures originally written for "The Nursing Mirror," and are now reprinted in the hope that they will be of general utility.

W. T.

NOTTINGHAM,

June, 1913.

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DIET IN DYSPEPSIA

short time ; that is, until the gastric juice is secreted in sufficient quantity to stop its action. The salivary ferment only acts in an alkaline medium, but the gastric juice is acid, and the permeation of the mass of food in the stomach by this acid fluid effectually stops its action. It takes some time, however, to do this. The food is often swallowed in masses like large pills ; and such masses may be sufficiently adhesive to prevent the gastric juice permeating them readily. The time usually stated for the action of the salivary ferment in the stomach is half an hour ; and during that period a considerable proportion of the starchy material is transformed into sugar. But the time necessarily varies with the circumstances. The mastication may be very imperfectly performed and very little saliva mixed with the food. Many foods are swallowed without mastication and do not get mixed with saliva at all.

There is also a variation in the secretion of the gastric juice. Moreover, there are two periods for the secretion of the latter fluid. There is what is known as the *appetite juice*, or *psychic juice*, and the *chemical juice*. The thought or taste of food provokes a secretion of gastric juice ; this is a mental effect, and therefore the secretion is called the *psychic juice*. It is an important part of the gastric secretion, and, like a crocodile's tears, flows at the thought, sight, smell, or taste of a pleasant meal. It is encouraged by mastication, hunger, the enjoyment of food, pleasant company, and agreeable surroundings. It does not occur when a person has no appetite ; and it is checked by pain, fatigue, fear, worry, and mental distress. This portion of the gastric juice, therefore, would not be secreted if a person had already been fed ; nor if the food is poured into the stomach through an oesophageal tube, or without the knowledge of the individual.

The second phase of gastric digestion depends upon the presence of food in the stomach. It is due to the formation of the *chemical juice* ; and the secretion is believed to be independent of the nervous system. It begins some little time after the food has reached the stomach, and is especially provoked by the presence of meat, game, fish, eggs,

soup, and similar substances. Why should these substances cause a secretion of gastric juice more than other foods? It has been shown that there is a strong association between the various functions of the body, that the activity of one organ depends on the proper performance of function by others. Efficient mastication encourages the secretion of gastric juice; but imperfect mastication leads to a smaller secretion of gastric juice. This is chiefly due to the association of the nerves which give rise to the appetite or psychic juice. But it has also been shown that the association of functions is due to the formation of chemical bodies called *hormones*, or chemical messengers. Gastric digestion produces such a hormone among the early products of digestion. The substances which most easily provoke the second flow of gastric juice, the chemical juice, are derived from the digestion of proteins (meat, fish, game, eggs, etc.). It follows, therefore, that an abundant flow of the chemical juice depends upon the previous secretion of the psychic or appetite juice; for the materials necessary to provoke it arise from the action of the appetite juice. Substances, however, occur in meat-juice, meat-extract, soup, and such-like articles, which have the same effect; when these are administered alone to dogs and men they provoke the secretion of gastric juice. This is the scientific basis for the custom of taking a small quantity of soup at the beginning of a dinner. When the chemical secretion is once started it goes on continuously for a period which depends more or less on the nature of the food and the time required for its digestion; but the flow is not always at the same pressure, it gradually rises and falls, the secretion reaching its height from one to two hours after a meal.

The gastric juice is an acid fluid. It contains several ferments or enzymes, the chief one being *pepsin*, which digests meat, game, poultry, fish, eggs, milk, cheese, the gluten of bread, and other proteins. It also contains a ferment called *rennin*, which curdles milk; and another one which assists in the digestion of fat. It should be noted that pepsin only acts in an acid medium; and that the acid of the gastric juice is hydrochloric acid. The proportion of

this acid is very small, only about two parts in 1000; but, little as there is of it, it is absolutely essential for the process of digestion in the stomach.

The passage of food through the alimentary canal has been studied by aid of the X-rays. A mouthful of fluid occupies five or six seconds in passing from the back of the mouth to the stomach. When solids are properly masticated they pass down to the stomach in about the same length of time. But when such food is not well masticated, or is swallowed in masses like pills, its passage is much slower. Swallowing is an involuntary act, when the food has passed through the mouth. It is due to a muscular movement, which passes the food downward. The opening into the stomach is guarded by the cardiac sphincter, which relaxes when the food passes through it, and closes again to prevent regurgitation.

The empty stomach is more or less pear-shaped, the wide end (at the left side of the body) containing some gas, the rest of the organ being contracted and its mucous membrane thrown into folds. The food which arrives in the stomach accumulates at the wide end, called the *fundus*. During digestion the stomach is divided into two parts—the fundus or cardiac portion and the pyloric portion. The fundus is the store-house of the food, and is not affected by peristaltic muscular movements. The pyloric portion is the active part, and it is affected by peristaltic muscular movements. The contents in the fundus remain alkaline in the centre, only the outer portion becoming acid; but all the food in the pyloric portion is acid.

The peristaltic movements of the stomach begin soon after the completion of the meal, and occur every fifteen or twenty seconds. They are due to muscular contractions which pass like a wave towards the outlet, and carry the food along. They serve a double purpose. In the early stage of digestion the pylorus remains closed, and, consequently, when the food is driven against it by each peristaltic wave it causes a central return current; thus we have a *churning movement* by which means the food is thoroughly mixed with the gastric juice. But as the digestion proceeds

the pylorus relaxes, the muscular contractions increase in strength, and the fluid or semi-fluid food is gradually ejected through it into the intestines.

The pylorus is surrounded by a strong muscular ring or sphincter, which is normally contracted to such an extent that it appears in an X-ray photograph as a fine line about $\frac{3}{4}$ inch long. Through this narrow orifice the partially digested food is driven by strong muscular contractions or peristaltic waves. It may easily be perceived that the nature of the food influences the *rate* at which it passes through. When a meal is consumed consisting of lean meat, suet, and rice, so prepared that the whole mass is of an equal consistency, the X-rays show that the carbohydrate (rice) begins to pass through the pylorus in fifteen minutes, part of it being reduced to soluble starch and part into dextrin and sugar. But the protein (lean meat) and fat do not begin to leave under half an hour, and are much slower in passing through. A meal consisting of carbohydrate alone (rice or potato) leaves the stomach rapidly, no trace being left three hours after the meal. A meal of protein and fat (fat meat, ham or bacon and egg) leaves the stomach more slowly, some being present six hours after the meal. A meal of carbohydrate and protein (bread with lean meat, fish or fowl) leaves the stomach in a period which is intermediate between the other two. The addition of fat hinders the digestion of food in the stomach, and therefore delays its passage through the pylorus.

The passage of food is likewise hindered by the consistency of its particles. The X-rays show that when a particle of hard food is driven to the pylorus by the muscular contractions the aperture is immediately closed tightly. Indigestible masses are thus returned over and over again until the hard pellets are softened and reduced to a semi-fluid condition. At the end of gastric digestion, however, even such masses may be driven through the relaxed pylorus, for small pieces of bone, cherry stones, plum stones, and other indigestible substances manage to escape into the bowels.

The passage of liquids through the stomach is governed

in the same way as other foods. Water taken on an empty stomach soon passes through the pylorus, but some of it is absorbed by the gastric mucous membrane. Fluids of a temperature higher than that of the blood are not allowed to pass through, but are retained until the temperature is the same as that of the body. Beer leaves the stomach more slowly than water; and liquids containing various salts are retained until they become of the same salinity or *isotonic* with the gastric juice.

Thus, by the exercise of a selective power, the stomach is able to protect the delicate mucous membrane of the bowels from the injurious effects of unsuitable materials.

The amount of digestion which is done in the stomach is great. Let us see how much has been done by the time the food has passed through the pylorus. It has been or should have been reduced to a pulp in the mouth. It is mixed with saliva. Some of the soluble substances are dissolved by that fluid; and some of the starch turned into sugar. It is now swallowed and slowly permeated by the gastric juice, which begins to be secreted during mastication. Until this permeation is complete the transformation of starch continues uninterruptedly, first into soluble starch, then into dextrin, and finally into sugar. In the stomach, however, the food undergoes further disintegration by the aid of the gastric juice. Meat, fish, or fowl is broken up into tiny fragments. The connective tissue which binds the muscular fibres together is dissolved; the chief substance, called collagen, being converted into gelatine and peptonized. The skin and gristle, also containing collagen, is converted into gelatine and peptonized. The muscular fibres, which form the chief portion of the flesh, are separated into tiny discs; the cement substance which was between the cells is peptonized; the individual cells are dissolved, the syntonin and fibrin which they contain are converted into proteoses and peptones. The covering of the muscular fibres, sarcolemma, consists of elastin, which is dissolved and peptonized. The influence of gastric juice on the coverings of animal cells varies. These coverings

differ in composition ; when the flesh is young and tender it consists of elastin or a similar material soluble in gastric juice ; but in older animals the cell coverings become exceedingly tough, more like horn, which resist the action of gastric juice.

The fatty portion of meat undergoes similar disintegration. The connective tissue which binds it together is first gelatinized and dissolved ; the covering of the fat cells is dissolved, and by this means the fat is set free and mixed in the same way as butter, lard, or oil with the other ingredients of the food.

Milk is curdled by the rennin ferment, and it should be remembered that this always occurs in the first stage of the digestion of milk. After a time the curds are broken down and their digestion by the gastric juice begun ; some portion being converted to peptone. Cheese requires very careful mastication, otherwise it will not easily dissolve in the gastric juice. Nevertheless, a small amount of good ripe cheese is a stimulant to digestion, and in so far it deserves the old adage : "*Cheese ! thou mighty elf, digesting all things but thyself !*"

Bread, biscuits, cakes, and puddings, if they have been carefully masticated, readily form an emulsion in the stomach and are thus prepared for complete digestion in the bowels. The less mastication such foods get, the longer they are in being prepared for transmission into the bowels, or in undergoing the transformation into sugar which is due to the salivary ferment. Potatoes and other vegetables are reduced to a pulp, and otherwise prepared for digestion in the bowels ; but the cellulose covering of vegetable cells is not attacked by the gastric juice.

The whole of the food is thus broken down by the teeth or the disintegrating power of the stomach, some portion of starch is converted into sugar, and a portion of meat, milk, fish, and eggs is converted into proteoses and peptones. The whole mass forms a creamy mixture or *chyme*, which is slowly propelled through the pyloric sphincter into the small intestines.

It may thus be perceived that, important as is the work of

the stomach, the entire process of digestion is not completely performed in that cavity. Indeed, so far as many foods are concerned, it may be said that digestion only begins there. Moreover, the work of the stomach, in certain cases, is entirely replaced by intestinal digestion. This occurs in patients who have had an opening made between the stomach and bowels by the operation of gastro-enterostomy. In these cases the food passes quickly out of the stomach into the bowels, and digestion appears to go on almost as well as in the normal process.

But the normal course of the food is through the pylorus to the bowels, and it goes through very slowly. The opening and closing of the pylorus, like the muscular contractions of the stomach, is governed by a nervous mechanism which causes the sphincter to relax each time a peristaltic wave reaches it, when the chyme passes through like a squirt or jet of water. Just as the sphincter is relaxed by a reflex movement, so it is closed by another reflex action, which is believed to be due to the arrival of the acid chyme in the duodenum. The presence of a small amount of acid chyme acts as a stimulus to the nerves in the duodenum, and a message is sent along them which is reflected to the pylorus and causes it to be closely shut until that portion of chyme is neutralized by the bile and pancreatic fluids; and this action protects the intestinal mucous membrane from injury by the acid fluid.

The bile is an alkaline fluid secreted by the liver; the pancreatic fluid is an alkaline secretion from the pancreas; and they are both important items in the digestive process. When the acid chyme passes over the orifice of the bile duct in the bowels it causes a reflex contraction of the gall bladder and a flow of bile into the bowels. The bile does not flow into the intestines when digestion is not going on; but, like the gastric juice, the flow of bile only occurs during digestion; nevertheless, it continues for several hours, and the total quantity of bile secreted in a day amounts to two pints or more. This fluid mixes with the partly digested food. It has no influence on proteins (meat, milk, eggs, etc.), except that it precipitates dissolved albumin. Neither has it much

influence on starch and sugar; but the pancreatic fluid has more effect on these substances in the presence of bile than when it is absent. But the bile has a definite influence on the absorption of fat, and is therefore an important element in its digestion.

The pancreatic fluid enters the duodenum through a separate duct, which opens into the bowel close to the bile duct. This fluid is of the greatest importance in intestinal digestion. It begins to be secreted as soon as acid chyme arrives in the duodenum, its presence being provoked by the action of a hormone or chemical messenger from the duodenum, called *secretin*; and it continues to be secreted for several hours after the meal is eaten. It contains three ferments or enzymes. There is *trypsin*, which digests proteins (meat, fowl, fish, game, eggs, milk, etc.); *amylopsin*, which transforms starch into sugar; and *steapsin*, which makes an emulsion of all kinds of fat and splits some of them into fatty acids and glycerine. Pancreatic fluid transforms all proteins into proteoses and peptones, and the latter into amino-acids, which are taken up by the mucous membrane and reconverted into the proteins (albumins and globulins) of the blood. It digests the nuclei of cells, and acts more powerfully than pepsin on elastin, but has no action on keratin and the cellulose of vegetable tissues and cells. Starch is rapidly converted by it into sugar. The various fats are made into an emulsion, which the cells of the mucous membrane eat up greedily. Some of the fats are split into fatty acids, which combine with carbonate of soda in the pancreatic fluid and form a soap which is easily absorbed.

There is still another digestive fluid. This is provoked by the presence of food in the bowels; it is secreted by the intestinal mucous membrane, and is called the *succus entericus*. Like the former fluids, it contains several ferments. One of these is of importance by assisting the trypsin of pancreatic juice. Another completes the digestion of starchy foods by converting the complex sugars into simpler sugars. Thus also the ordinary domestic sugar, malt sugar, and milk sugar, are converted into dextrose, levulose, and galactose, which are much more simple and readily diffused

through the coats of the bowels or are absorbed by the mucous membrane. It has no action on fat or starch. But it has a definite influence on proteins and assists in converting peptones and proteoses into amino-acids, which are quickly absorbed. The amino-acids are of great importance, as it is from these substances new blood and flesh are formed; whence they have been called "building stones".

Thus we have seen that most of the food is transformed by various ferments or enzymes from insoluble substances which cannot get into the blood to soluble materials which readily pass through the mucous membrane or are taken up by the cells of the mucous membrane and passed on to the blood to be circulated to the various tissues and organs of the body. There is naturally a certain amount of residue, consisting of indigestible particles which the enzymes have not affected. The amount of this residue varies according to the nature of the food; but it is mixed with some mucus from the bowels, the degenerated cells from the mucous membrane, the remains of bile and other secretions, and an enormous number of bacteria, which together constitute the faeces.

CHAPTER II.

INDIGESTION.

THE most common dyspeptic trouble, and probably the most common human ailment, consists of the group of symptoms usually denominated indigestion or dyspepsia. No account of the diseases of the alimentary canal would be complete without separate consideration of them. These symptoms are abnormal sensations of different kinds, such as a sense of weight, fullness, sinking, shooting, aching, burning, or boring referred to the region of the stomach, the chest, or the back, especially between the shoulders. This discomfort arises in some cases when the stomach is empty and disappears when food is eaten ; or it comes on after food and lasts a time varying from a few minutes to several hours ; in other cases the discomfort is almost continuous. There is generally some flatulence and eructation of gas. The flatulence is often associated with the abnormal sensations ; the eructation, or belching of gas, frequently gives considerable relief to the painful feelings or discomfort, and it is often noisy and uncontrollable. The belching may be accompanied by the regurgitation of food, or of a fluid having a sweet, sour, or neutral taste (*water brash, pyrosis*) varying in quantity from a teaspoonful to a pint. Vomiting, preceded by nausea, is sometimes a symptom. The appetite may be normal or deficient ; the tongue clean and healthy, or more or less thickly coated ; there may be constipation or diarrhoea ; the urine may be normal, or scanty, highly coloured, and giving a deposit. There are secondary phenomena, such as headache, giddiness, vertigo, restlessness, sleeplessness, mental depression, melancholia, palpitation or irregularity of the

heart, etc. It must, however, be distinctly understood that, while *dyspepsia* is a name applied to this group of symptoms, there is no discoverable local manifestation in the stomach or constitutional effect which gives a warrant for the establishment of the group as a separate and distinct disease. As a matter of fact, "indigestion" or "dyspepsia" includes *all* the functional derangements of the stomach, and most of those of the bowels, as well as the liver. It occurs in the course of very many morbid states of the body which are independent of the stomach, and may have a constitutional origin or an origin in some part of the body quite remote from the stomach. Consequently, as pathological knowledge increased the term became limited in its applicability, while the diseases of the stomach which present the same symptoms were more definitely understood.

Nevertheless the stomach becomes deranged from many causes connected with the food itself, or with the conditions and circumstances under which it is consumed. Thus, if the food is not properly masticated, either because of undue haste in eating, defects or absence of teeth, soreness or ulcers of the tongue or mouth, or even from toughness of the food, there must necessarily be a delay in the disintegration of such foods in the stomach and consequently a delay in their passage into the bowels. Imperfect mastication is often one of the causes of indigestion; it may be the sole cause. In such cases disorder arises because the process of dissolution of the food is unduly prolonged; or because the gastric juice is unable to disintegrate the masses which have been swallowed, and consequently they are either vomited or discharged into the duodenum with pain and difficulty. This delay of food in the stomach is of importance, as will be seen later on; it means that the stomach is always at work, never empty; another meal being taken before the previous one is disposed of. The continued presence of food in the stomach is a source of irritation, it causes catarrh of the mucous membrane, an excessive secretion of gastric juice or of hydrochloric acid, and in the end may lead to dilatation of the stomach, or to atrophy of the gastric glands and a deficiency of the gastric juice.

An excess of food is injurious to the stomach in a similar manner. It throws a larger amount of work on the stomach in manipulating and disintegrating the food and passing it on to the duodenum. If large meals are very often taken, they not only disturb the stomach by keeping it constantly at work, but they cause an excessive secretion of gastric juice or else hyperacidity. Many people continue to take an excessive amount of food with impunity for years; but there are very few people who can always continue to do so: an excess of food does little harm to children or young adults, but in middle life it is a factor in the production of dyspepsia, for, like other overworked organs, the stomach becomes unable to do its duty; it loses its muscular tone; it ultimately becomes unable to secrete enough gastric juice, or either the pepsin or hydrochloric acid becomes deficient.

The excess may consist of some particular class of food. A large quantity of meat eaten regularly day by day is a great tax on the stomach, since the action of gastric juice is necessary for the digestion, which is completed by the pancreatic juice. The excess of meat is often accompanied by the consumption of an unusually small amount of bread, potatoes, and other vegetables; consequently, the body has to draw upon its store of fat for its supply of heat and energy, and the person becomes thin. At the same time extra work is thrown on the liver to metabolize the waste materials from the meat, and on the kidneys, which have to secrete them, and both liver and kidneys may ultimately suffer in consequence.

The consumption of too much fat is also likely to interfere with digestion. In the first place, it delays the disintegration and dissolution of the food which is necessary for its digestion; secondly, it checks the secretion of gastric juice; and, thirdly, a large quantity of fat leaves the stomach with difficulty, if at all, and may undergo decomposition.

The excessive consumption of carbohydrates, especially ordinary sugar (*cane-sugar*) and sweet foods, will cause catarrh of the mucous membrane of the stomach; and, by coating the food with mucus, prevent the access of the gas-

tric juice to it. An excess of sweet cakes, and even ordinary bread, causes many people to have heartburn, acidity, flatulence, palpitation, and other disagreeable symptoms. If bread, toast, and similar foods are not thoroughly masticated, they do not undergo that transformation into dextrin and maltose (*malt sugar*) which is the ordinary result of salivary digestion. They therefore enter the stomach in the form of insoluble starch, which mechanically interferes with the action of the gastric juice ; digestion is thereby delayed, the food is detained a long time in the stomach, and fermentation occurs, with the development of gas and irritating acids.

The presence of bran in wholemeal bread or coarse oatmeal and of fibre (*cellulose*) in vegetable foods is another cause of the indigestion of foods. Cellulose is the substance which gives firmness to vegetable structures : it is to them what gristle and bone is to animals. Therefore, one may easily understand the difficulty of digesting it. Moreover, it gets tougher and harder as it increases in age. Whereas the soft cartilages of a young animal become *ossified*, the cellular tissues of the vegetable become *lignified*—that is, they are turned into wood. This is observable by comparison of a young and an old carrot ; a young carrot may be as tender as a potato, an old one as hard as match-wood. A similar comparison may be drawn between young and old kidney beans : the young pods are so tender that they snap readily, whence the Americans call them “snap beans” ; but old ones are stringy, the fibres becoming coated with a material which makes them as tough as horn. We can easily understand how it is that pain and even sickness may arise from the consumption of radishes, onions, carrots, turnips, cabbages, and various other vegetables, when we consider that the older they are the more *lignin* is deposited on the cells which form the fibres, and coats them with a substance like cork or wood, and renders them inaccessible to the digestive juices.

There is no doubt that condiments and spices are also detrimental when taken in excess. The agreeable sensation of warmth following the use of mustard, pepper, horseradish,

is due to these substances causing the mucous membrane to be flushed with blood: the glands are thereby excited to secrete gastric juice and mucus; but the stimulation may become a chronic irritation, with hypersecretion or catarrh. A certain amount of vinegar is a useful addition to cabbage, green peas, kidney beans, and other vegetables: acid fruits are also useful to the body; but an excess of such acids results in a derangement of the digestive functions, which is easily observable when persons persistently eat lemons or take an immoderate quantity of lemon juice or lime juice. An excess of tea or coffee, especially if taken with meat or when digestion is at its height, is equally injurious. Foods which are too hot or too cold are also injurious, and are very liable to cause a catarrh of the stomach: whence arise the injurious effects of ices, ice-creams. Alcohol causes or aggravates every form of indigestion.

CHAPTER III.

PAIN IN DYSPEPSIA.

A FEW of the symptoms of dyspepsia require a more detailed consideration. Any pain in the region of the stomach, and especially when associated with the consumption of food, is a *dyspepsia*. But all pains in the stomach are not due to the presence of food. There may be pain in the stomach when its cavity is empty, e.g. *gastralgia*, which is an actual pain occurring in paroxysms and relieved in all probability by taking food. But the pain in an empty stomach may be due to acute gastritis, to malignant disease, to neuralgia, to bacteria, or to poisons.

But pain occurring after food is far more common. This may be a localized or a diffused pain. A pain diffused over the epigastrium (pit of the stomach) may be due to acute gastric catarrh; acute gastritis due to alcohol, poisons, bacteria, or injury; or chronic dyspepsia and hyperacidity or organic acidity due to fermentation by bacteria. The thermometer would, of course, help to distinguish between them. A localized pain is due to an ulcer, sometimes a cancer, and such pain is not always in the stomach, but may be in the back and associated with tenderness in the dorsal region.

It should not be forgotten that a pain in the region of the stomach is not always due to a disease of that organ. A pain in the pit of the stomach may be due to distension of the transverse colon, abdominal neuralgia, muscular rheumatism, and allied conditions. Pain in the left side (lower part of axilla and hypochondrium) may be due to a dilated stomach, to distension of the stomach by gas; but it may also

be due to an enlarged spleen, a dilated colon, or movable kidney. Pain in the right side may be due to disease of the liver, gall-stones, a loaded colon, and various other things.

The sensation of weight, discomfort, or fullness in the stomach, which occurs directly or some hours after meals, and is not attended by actual pain, is usually due to indigestion, gastric irritation, hyperacidity, loss of motor power in the stomach, dilatation of the stomach, distension by gas arising from bacterial fermentation. Such sensations, which are sometimes referred to the front of the chest or behind it (between the shoulders), may arise from the stomach being too full, overloaded by solids or liquids, especially when the motor power of the stomach is deficient. It may be the presence of some particular article which causes the pain or discomfort ; for example, new bread, hot cakes, pastry, pork, veal, mackerel, salmon, lobster, pickles, cucumber, radishes, raw fruit or heavy vegetables. It may be caused by an excess of some condiment, such as vinegar, mustard, horseradish, or some other food accessory.

In acute catarrh of the stomach the pain is of a burning and darting character, often passing through to the back. It is frequently aggravated by deep breathing, and is accompanied by a similar pain in the chest and a sense of oppression. There is considerable tenderness of the region of the stomach. The abdominal muscles are frequently contracted in a spasmotic manner over the stomach, to protect the organ from pressure, and the breathing is shallow and frequent with the same object.

In chronic catarrh the pain is diffused over the whole region of the stomach, and often between the shoulders ; it begins soon after a meal and lasts a time varying from a few minutes to several hours, or even until the time of the next meal. In this disease the pain is relieved by vomiting, and the patient, conscious of the fact that it is the presence of food which causes the pain, sometimes induces vomiting by putting the fingers into the throat. In mild cases the pain is less severe, and may not begin until an hour or two after food.

In dilatation of the stomach the symptoms arise somewhat

later; pain occurs about four to six hours after the meal, and may occur only once in two or three days. The pain is referred to the stomach, but as this organ is often very much displaced, it is felt in the region of the umbilicus rather than at the pit of the stomach. The gastric sensation begins as a slight uneasiness or discomfort, and is accompanied by eructation of gas, distress of the heart, and difficulty in breathing. This discomfort may be a burning sensation or a dull aching pain, but it increases until it becomes more acute and is usually only relieved by vomiting.

In ulcer of the stomach the pain is one of the most characteristic symptoms of the disease. It is a localized pain, coming on after food, felt over an area of only one or two inches in diameter in the pit of the stomach, but usually (not always) goes through to the back and is felt on the left side of the spine, between the tenth dorsal and first lumbar vertebra. The anterior region where the pain is felt is marked by a local tenderness over a small area above and to the right of the umbilicus.

In duodenal ulcer there is the characteristic "hunger pain," coming on after food. When an ulcer of the stomach or duodenum perforates it causes a very acute pain in the upper part of the abdomen sufficiently severe to double the patient up, and causes vomiting, faintness, and other signs of collapse. Although at first the pain is localized, it very soon becomes diffused over most of the abdomen, owing to the escape of the stomach contents into the peritoneal cavity.

In cancer of the stomach the pain is accompanied by local tenderness. In some cases, however, there is a mere sensation of weight and oppression which is quite insufficient to indicate the severity of the cause; in other cases, where the disease implicates some solid organ or bone, the pain is of a dull and gnawing character. Most usually, however, the pain is more or less intense, described as aching, burning, cutting, or stabbing, and referred either to the pit of the stomach or between the shoulders.

There are other pains in or about the region of the stomach. Sometimes when attending a patient for some

other disease, the question arises as to whether the pain is or is not in the stomach. There is, for instance, the troublesome "spasm of the stomach" which one occasionally comes across. It is a sudden, severe, griping pain in the pit of the stomach, extending to the back, and causing faintness, a shrunken appearance of the face, cold hands and feet, and an intermittent pulse. It suggests to the mind either gall-stones or perforation. But although the pain is bad enough to make the patient call out, there is usually no tenderness over the stomach; on the other hand, the patient bears pressure well, and either presses his hands over the stomach or presses the stomach against something to relieve the pain. The attack only lasts a few minutes, at most half-an-hour, and ceases suddenly with eructation of gas or watery fluid or by vomiting. This, however, is not a disease of the stomach: it may be a nervous affection dependent upon an irritation of the branches of the pneumogastric nerves or solar plexus; possibly an inflammation of the nerve sheath, maybe a small tumour. Moreover, it may be of central origin and depend on some affection of the brain or spinal cord. It is observed in anaemic or chlorotic women; it is one of the most frequent symptoms of hysteria. It may arise from sympathy with uterine troubles, especially displacements, chronic inflammation, or ovarian mischief. But it is not confined to women, and it occurs in men who are gouty, have malaria, or some other blood disease, as well as from tumours on the nerves or central nerve diseases.

Similarly, the pain arising from gall-stones may suggest gastric trouble. An attack of biliary colic, however, begins unexpectedly and suddenly. It is a piercing, griping pain, which starts from the right side and spreads from the gall bladder over the region of the stomach, possibly over a large area of the abdomen, and even up to the right shoulder. The patient sighs and moans; perhaps doubles up and rolls about the bed or floor. But as soon as the stone passes through into the duodenum the pain ceases almost at once, although it leaves some pain and tenderness owing to the stretching of the bile duct and irritation of the nerves.

In intestinal troubles there is often considerable aching

and gripping ; if the affection is in the small intestines this pain is referred chiefly to the umbilicus. When the large bowel is affected, however, the position of the pain varies. In inflammation the pain is often agonizing, and is due to spasmodic contraction and movements of the intestines. Similar pains, however, may arise from faecal accumulations. When this is in the hepatic flexure it may simulate some disease of the liver, perhaps gall-stones, biliary colic. Pain on the left side may not be from the stomach at all ; it may rise from pleurisy, a localized peritonitis, movable kidney, hydronephrosis, or impacted faeces. If a large part of the colon contains impacted faeces, there may be a pain which very much resembles some of the gastric pains : and if the cæcum is loaded it may simulate appendicitis.

CHAPTER IV.

THE RELIEF OF PAIN IN DYSPEPTIC CASES.

THERE are many cases in which much can be done at least to relieve pain. In chronic gastric catarrh, the disease is sometimes intercurrent with some other affection, probably considered to be far more serious. In these cases, pain is often considerably relieved by administering something to "bring up the wind". The simplest remedy for this purpose is hot water. It can generally be given whenever and as often as it is necessary. It causes an expansion of the gas in the stomach, and by this means stimulates the muscles to contract and relieves the organ of the distension which is one of the chief factors in causing the pain. But the hot water also acts as a warm fomentation, and is soothing to the stomach by the direct application of moist heat.

Another useful remedy for gastric pain is bicarbonate of soda in the proportion of half to one teaspoonful in a tumblerful of hot water. There can be no doubt about the soothing influence of this remedy. It neutralizes acidity in the stomach and thereby removes one of the sources of gastric irritation and an element in the causation of pain; but it does more than this: by its combination with the acid it causes a generation of carbonic acid gas, which is also soothing to the mucous membrane, and by raising the pressure of gases in the stomach still further stimulates the muscles and produces eructations, to the great relief of discomfort. There are other remedies of a similar character. These are the various waters, some one or other of which may already be in use. I mean soda-water, Apollinaris, and Perrier. In Apollinaris we have not only bicarbonate of

soda, but an abundance of carbonic acid gas in a preformed state. In Perrier we have a water containing not more than 1 per cent of minerals, chiefly lime; but there is an abundance of natural gas which makes it as superior to soda-water as good wine is to a mixture of alcohol, cream of tartar and water. There are other waters also, such as those of Vichy, Vals, Bilin, Ems, and Tarasp, which contain bicarbonate of soda but very little gas, and have the same effect when given with an equal quantity of hot water.

In hyperacidity or acid dyspepsia, also, the use of sodium bicarbonate or one of the alkaline waters relieves pain by neutralizing the acid gastric juice. In organic acidity they neutralize the organic acids arising from fermentation. This can be illustrated by adding a little bicarbonate of soda or one of the alkaline waters to a solution of hydrochloric acid, citric acid, vinegar, or lemon juice and water, which contain the same or similar acids to those in the stomach. When this is done, it will be found that the fluid which previously had an acid taste and irritating qualities has become neutral, or alkaline and unirritating. Therefore, while hot water relieves pain by dispersing wind and soothing the irritated mucous membrane, the bicarbonate of soda, or alkaline water containing it effects the same purpose by neutralizing the acids which irritate the mucous membrane.

The pain in the stomach may, however, be due to other causes than flatulence and acidity. It may arise from the nature of the food. Suppose it is due to eating radishes, cucumber, lobster, pickles, pork, veal, pastry, or some other article likely to injure a weak stomach. It would do little good in such a case to keep pouring solutions of bicarbonate of soda into the stomach; it is true the soda is a sedative apart from its effects as an antacid, but it would do far more good to encourage the stomach to eject the offending substance. And this remedy is actually adopted in many instances. The pain arising from such foods may be sufficiently great to be called "cramp"; that is to say, the stomach hurts itself by contracting in an irregular manner upon these hard substances, or by attempting to propel them

into the intestines. At the same time, the nervous mechanism becomes deranged, the excretion of gas by the gastric mucous membrane is increased, the stomach is thereby distended, and aggravates the symptoms. In such a case the most rational remedy is an emetic. Mustard and common salt are generally handy, and are usually effectual. Let two teaspoonsful of mustard be made into a paste and given in a tumblerful of hot water; it will speedily make the patient vomit. Common salt, a dessertspoonful in the same amount of hot water, is almost equally speedy in its effects. If they do not act, the dose must be repeated. I have generally observed that mustard is the most effectual, but at the same time it is more irritating to the gastric mucous membrane, and is liable to aggravate the catarrh which the irritating food may originate.

Then there is the pain which occurs in an empty stomach, that is, in acute gastritis, acute gastric catarrh, neuralgia, and cancer of the stomach.

In neuralgia of the stomach the pain is very frequently relieved by taking a warm meal of a reasonable and nutritious character. With that remark we can dismiss it for the present.

In acute gastric catarrh the relief of pain is to some extent brought about by keeping the stomach empty, or at any rate allowing only small particles of ice to relieve thirst. The application of warmth over the pit of the stomach is a valuable aid to other treatment. A piece of Gamgee tissue or flannel wrung out of very hot water and sprinkled with a tablespoonful of turpentine will often afford relief. The region may be painted thickly with glycerine of belladonna or opium liniment, covered with Gamgee wrung out of hot water, then a layer of oiled silk, next a layer of cotton wool, and finally a binder to keep it in place. The application of dry heat is useful in some cases, and for this purpose an indiarubber hot-water bottle, or an abdominal hot-water tin, can be used; but the patient often finds the weight too much for her. A light and useful application is a mustard plaster, which can be kept on for half an hour, and afterwards replaced by a layer of cotton wool.

In those excessively severe cases of acute gastritis which are due to powerful irritants, such as poison, also in the acute form due to infective diseases, such as puerperal fever, the inflammation runs very high, and may cause sloughing, possibly the formation of pus in the tissues of the stomach, and abscesses which burst into its cavity, warm applications may still be useful. They may consist of those already named, or linseed and opium poultices, starch poultices, antiphlogistine, etc. But the pain in the stomach is often of a burning character, sometimes described as being "like a fire," and, therefore, cold applications may afford more relief. A cold lead lotion, or the old-fashioned evaporating lotion, would not be despised. But the application of Leiter's tube, with a constant stream of cold water through it, and an ice-bag or pounded ice placed between two layers of flannel, would be more appreciated.

In cancer of the stomach relief from pain may be given by warm applications, but the chief reliance must be placed upon drugs, with careful selection and preparation of the food. Similar remarks apply to the pain of gastric ulcer. It would not do to apply warm applications over the stomach while haemorrhage is going on, and the relief of pain would then depend on the use of cold applications, which would also be the best local application to check the haemorrhage. If, however, perforation is suspected, a warm application would give most relief; antiphlogistine, starch poultices, turpentine stupe, or cotton wool would be useful. Such applications, however, would only be used until an operation is arranged, and is about to be carried out.

The nurse's ingenuity will often be taxed to find the means of relieving pain in gastric cases, but there is probably no class of cases which will better repay her for study than this. The stomach sympathizes with almost every other organ in the body, and, consequently, pain in the stomach is one of the most common complications met with, even when the stomach itself is not at fault, as exemplified in the gastric pains of locomotor ataxy and the gastric crises of Bright's disease.

CHAPTER V.

VOMITING.

VOMITING is a reflex act produced by many causes. It is a very complex performance, and it is governed by one of the nerve "centres" in the *medulla*. The vomiting centre is easily excited by various things, such as tickling the throat, an irritation of the stomach, liver, bowels, or peritoneum, and even of some parts of the body which have no direct connexion with the stomach. It will be as well to give a list of the chief causes of vomiting other than gastric diseases. *Mechanical causes*, such as tickling the throat, or violent coughing after a meal, are very liable to produce vomiting. *Irritation of the organs of special sense* by offensive odours, horrible sights, or disagreeable sounds, will cause vomiting. These modes of irritation do not have the same effect on everybody; thus, one person may be caused to vomit by the odour of apples, and another by some sort of perfume which would not be disagreeable to the average individual. *Severe pain* arising from the passage of a gall-stone, renal calculus, dysmenorrhœa, or from an injury to some part of the body, is liable to cause vomiting. It occurs in *inflammation of the kidneys*, and especially in uræmic poisoning. It is commonly a symptom of meningitis, tumours of the brain, neurasthenia, hysteria, and functional derangements of the nervous system. It likewise occurs at the onset of various infectious diseases, especially in children. Pregnancy is a common cause, and it may be the result of various drugs. Some emetics, such as tartar emetic and antimony wine, are carried in the blood stream and act by directly irritating the vomiting centre; indeed, they will

produce vomiting when injected into the blood; others, like mustard, act indirectly by irritating the mucous membrane of the stomach; and still others by their nauseous taste or odour act upon the vomiting centre indirectly, *i.e.* through the higher nerve centres or organs of special sense.

When a person is about to vomit there is usually a profuse flow of saliva, the skin becomes pale and moist with perspiration. The actual process of vomiting is attended by a full inspiration, a contraction of the diaphragm, and a simultaneous spasm of the muscles of the abdomen; at the same time there is a relaxation of the cardiac sphincter and some contraction of the stomach itself, and the combined pressure produces an evacuation of its contents.

When vomiting occurs in *dyspepsia*, using this word in an extended sense, it usually occurs soon after a meal, that is within half an hour, but it may be delayed an hour or two. It does not occur in every dyspeptic patient, and in some patients it occurs only at long and irregular intervals. The vomited matters necessarily vary in appearance with the time which has elapsed since the consumption of the food. In some cases the food is very little altered, and the description usually given is that "it came back just as she took it". In other cases the vomiting does not occur until long after the meal is eaten; the material brought up has probably undergone fermentation, has a fermented or a sour smell, the odour of rotten eggs, of putrefaction, or of faeces; it presents a brown frothy scum and more or less sediment when it has been standing. The quantity of material brought up varies considerably. It may be little more than regurgitation or "repeating of the food," which is very similar to the normal *rumination* of cattle and other animals who "chew the cud"; or it may be an eructation of a little sweetish or sour fluid and wind. There is every variation in the quantity between this and the enormous volumes which are brought up from a badly dilated stomach. When vomiting occurs while the stomach is empty, that is without food, the material which comes up consists chiefly of saliva and ropy mucus or, perhaps, bile; in some cases it consists of an acid fluid, sometimes gastric juice sour enough to set

the teeth on edge. The vomiting in these various cases should be distinguished from each other more clearly.

In *acute gastritis* vomiting is frequently the first symptom complained of. It occurs repeatedly and becomes painful and distressing to the patient. The vomit consists first of food, and any attempt at feeding induces it. But it goes on even when the stomach is empty, and continues, attended by nausea, violent retching, and painful hiccup, until mucus comes up streaked with blood or mixed with bile.

In *chronic gastritis* the vomiting is different. It is a common but not a constant symptom. It nearly always has reference to the food, and seldom occurs when the stomach is empty. It usually comes on after meals, and may occur two or three times a day or only at intervals of months. It is not usually succeeded by retching and hiccup, but by complete relief of the pain and other disagreeable symptoms which the food may have induced. The vomiting, however, may be due to *chronic gastro-duodenal catarrh*, and is then liable to take the form of "morning sickness," especially in alcoholic subjects. It occurs before food is taken, and the material brought up consists of saliva which was swallowed during the night, possibly some remnants of the last meal, and mucus. The latter varies in amount from a few pellets of glairy substance floating in a scanty fluid to an abundance of ropy material whose character is best observed by pouring it from one vessel into another. If there is much food in the "vomit before food" it is an indication of considerable delay in the digestive process, and enfeeblement of the motor power of the stomach, and possibly more or less dilatation.

In *dilatation of the stomach* the vomiting is again different. The typical vomiting of dilatation is very easy and free; it is not usually preceded by nausea, but there is a good deal of discomfort and possibly some pain in the region of the umbilicus. The vomiting does not occur every day as a rule; as a matter of fact it does not occur for a week or two together in many cases of dilatation, but when it does happen the amount brought up is very abundant, varying from two to eight pints, and comes up so easily as to give the im-

pression of its being "pumped up". The vomit is often exceedingly irritating to the throat and mouth, and causes a burning sensation in the chest and throat and sets the teeth on edge. It consists of a variety of materials, and includes undigested articles of food eaten perhaps a week before; it is sour, fermented, and offensive to the smell. But the relief which is experienced by the removal of the accumulated food, secretions, and products of fermentation is so great that patients sometimes voluntarily provoke vomiting by irritating their throat with their fingers or a feather.

In *cancer of the stomach*, vomiting is one of the chief symptoms; but it occurs at irregular periods and gives no relief from pain. If the cancer obstructs the pylorus, the passage of the food will be hindered and consequently the vomited materials may have the same characters as in dilated stomach, besides containing traces of blood, or changed blood having the appearance of "coffee grounds".

Where there is an *ulcer of the stomach* the vomiting is also irregular. In some cases it occurs after almost every meal; in others only occasionally. It may occur half an hour or two or three hours after the meal. It is preceded by pain and followed by relief; and the material ejected consists of food which is either unchanged or more or less digested, according to the length of time it has been in the stomach. It is never fermented or putrid, but may contain blood, which varies in amount from a mere trace to "quarts" of blood.

In *nervous dyspepsia* the vomiting is peculiar in being about the only serious part of the malady. It is an affection which sometimes occurs in hysterical or neurasthenic women. It is often associated with a good appetite, even a voracious appetite, inasmuch as the remark is sometimes made, "She eats until she makes herself sick". This is not strictly true, because the appetite is not always abnormal; and the patient may only vomit occasionally or at some particular time of the day. The vomited food may be very little changed, but she often appears to bring up more than she ate, because she vomits the gastric juice which is apt to be abnormally abundant. This is often associated with abnormal cravings and desires, which show

themselves in various ways, e.g. the consumption of chalk, slate-pencils, coal, clay, and other articles of an innutritious character. Such cases show the influence of mind over matter. Behind the reserved, moody, tricky, wilful behaviour there is nearly always some mental cause, some disappointment, or hope deferred, which being satisfied would lead to the restoration of health. These patients require judicious, but firm, handling. It is worse than useless to be harsh; no good will be done by "driving" them; you would defeat your object. It is better to cultivate a kindly manner, to mix your firmness with pleasantry, to endeavour to lead in the way you wish them to go. They are to be pitied; but you must not show them pity. They lay themselves out for all the sympathy, fuss, and attention they can get, and their bodily and mental functions deteriorate under such influence.

The peculiar nervous dyspepsia of men, which is not so common, is generally associated with some inflammation of the sheath of abdominal nerves, perhaps the pneumogastric or sympathetic nerve. It gives rise to vomiting of a similar character, pain, and other distressing symptoms. The mental changes are not the same as in women, but the patient is apt to become gloomy, pessimistic, and melancholic.

Vomiting is rarely absent from *obstruction of the bowels*. At first this is merely sympathetic, and the substances brought up consist of food, more or less changed by digestion. By and by, however, the character of the vomit changes; it becomes of the consistency of pea-soup and has a faecal odour owing to decomposition, but the material is seldom truly faecal, although it is called "stercoraceous," that is dung-like.

It is an established fact that the nearer the obstruction is to the stomach the more severe is the vomiting and the sooner it begins. The vomiting is very persistent. When the obstruction does not give rise to a complete mechanical occlusion of the bowels the vomiting is constant, and may be incessant. The stomach rejects everything which is put into it. But the vomiting will not become stercoraceous or eculent in the majority of cases however long it may last,

nor however obstinate the constipation may be. But if the mechanical occlusion of the bowels is complete the vomit becomes stercoraceous by about the third day, sometimes sooner, and never ceases until the obstruction is removed.

When the obstruction is acute, such as occurs in strangulation of a piece of the gut, the patient is struck with a severe pain, usually at a fixed spot. The pain is sufficiently severe to cause considerable depression approaching to faintness or collapse. Vomiting speedily occurs. The abdomen becomes tender, swollen, and distended by flatus, which causes rumbling and gurgling noises.

If the obstruction comes on slowly, or is chronic, as occurs from the growth of a tumour outside the bowel, stricture or malignant disease of the bowel, constipation is for a long time the most prominent symptom. There is then comparatively little constitutional disturbance for a considerable time. But the abdomen becomes gradually swollen and tympanitic, with rumbling and gurgling in the intestines, eructations of food and wind, much retching, and finally vomiting. Moreover, in such cases the vomiting does not begin, even when the obstruction becomes complete, until some time, perhaps a week or ten days, has elapsed; but the presence of stercoraceous matter in the vomit is then a serious symptom.

Thus we may say that if the obstruction is in the small intestines the vomiting comes on pretty rapidly and is severe; but if the obstruction is in the large intestines the vomiting is longer delayed, may never be a very prominent sign, and might be due to constipation. When the obstruction is due to strangulation of the bowels, there is nausea, hiccup, fever, and inflammation, as well as vomiting. When the obstruction is due to intussusception, impaction of foreign bodies, gall-stones, compression by a tumour, or pregnant uterus, the obstruction occurs more slowly, fever and inflammation are usually absent, and vomiting is a very late symptom.

In *brain affections* also the vomiting is accompanied by the special signs of the disease. In tubercular meningitis the vomiting when it occurs is more or less uncontrollable;

but it is associated with some rise of temperature, headache, intolerance of light and sound, fretfulness, peevishness, the peculiar cry which is characteristic of the disease, and the "blush" on the skin which speedily follows a pencil mark or finger-nail drawn across it (*Tâche cérébrale*). In cerebral tumour the vomiting is often one of the earliest symptoms complained of; and it is unaccountable; there has been nothing to explain it; it comes on at irregular intervals and without obvious cause. It is usually unattended by nausea or loss of appetite; but there are headache, giddiness, perhaps a staggering gait, epileptiform attacks, and other signs showing a disturbance of the circulation in the brain; and squint or other obvious abnormal affections of the special senses arising from pressure upon the brain.

CHAPTER VI.

THE RELIEF OF VOMITING.

IN order to avoid confusion the treatment of vomiting from these various causes should be carried out as far as possible on general lines. It would be rather puzzling to the reader if a separate treatment were given for vomiting in each of these cases. Moreover, such a course is quite unnecessary.

There are very few cases where the administration of an emetic is requisite ; but this preliminary treatment may be necessary in cases of acute indigestion due to the consumption of indigestible foods. In these cases the vomiting will cease as soon as the cause is removed. In all other cases it is equally necessary to find out the cause and remove it ; but it is not always easy to do so. In the meantime a good deal can be done to subdue the gastric or nervous irritation which is producing it. First and foremost there are the means of acting on and through the stomach. It is obviously useless to endeavour to force a large quantity of anything upon the stomach ; indeed, that would be one of the surest means of keeping up the irritation. We must begin by giving only the very smallest quantity of nutriment at a time, and it must be of the blandest and least irritating character.

Milk may be tried, but not pure milk. The best mixture is probably equal parts of milk and lime-water. The milk should be boiled, but can afterwards be cooled, or even iced ; and it should have just a little salt added to it. Lime-water is a sedative to the stomach, but it is chiefly of

value by preventing the formation of large curds of milk. The curds from milk and lime-water are very much smaller and softer than those formed from milk alone. Lime-water also neutralizes the slight acidity which is ever present in milk. The amount given at a time should not exceed a tablespoonful of milk and lime-water; but this should be given very often. If the stomach settles down under its influence the amount given each time should be increased every hour by adding a tablespoonful to the dose, until the patient can take two or three ounces at once, making a total of two pints in twenty-four hours. As soon as the patient can take and keep down four ounces of milk at a time we can also give some Bovril, Lemco, or beef-tea to the extent of a half-pint in twenty-four hours. Such would be the beginning of treatment in an ordinary case of vomiting which did not threaten to give rise to much anxiety. But in a bad case milk and lime-water, even in teaspoonful doses, might not be retained. The substance should then be quickly changed. It is useless to persist in giving the patient a food which obviously disagrees. Barley-water and milk, in equal parts, can be tried. I have found that ALBUMIN-WATER will often be retained when everything else is rejected. This food consists of the white of one raw egg in a small cupful of lemon-water, and just enough sugar to make it palatable. It can be iced. It should not be given in too large a quantity at once. Begin by giving a teaspoonful every five minutes; if that is retained for half an hour you may increase the quantity to a tablespoonful every fifteen minutes. But do not try "to force the speed"; if you do the vomiting will recur and the process will have to be commenced again. You must "make haste slowly". When you feel pretty sure that a tablespoonful of albumin-water will be retained you can add some Valentine's meat juice or Bovril to it. I have a special liking for Valentine's meat juice, and always recommend it for these cases. The quantity of any of these meat extracts, however, would be one teaspoonful in a cupful of albumin-water.

If albumin-water given in teaspoonful doses is rejected the outlook is pretty bad. We should then not be satisfied

by icing the fluids, but give the patient small lumps of ice to suck ; and now and then pour a few drops of Valentine's juice over a small lump of ice just when it is being put into the patient's mouth. Why did I not give ice sooner ? you ask. Because the amount of nourishment which is retained in twenty-four hours by these patients is a mere starvation diet, and it seems to me absurd to reduce the quantity more than is absolutely necessary. Ice the milk and lime-water or the albumin-water by all means ; the colder it is the better ; but be sure the patient gets a little nutriment, and thereby ward off a state of collapse. A teaspoonful or two of iced champagne, or, in its absence, brandy and soda, is valuable not only for warding off collapse, but by assisting to subdue gastric irritability. The carbonic acid gas in champagne, soda-water, potash-water, Perrier, and Apollinaris is a useful sedative and assists in overcoming the tendency to vomit in a large number of ordinary cases ; but a large bulk of fluid would *not* be retained. If it is suspected that alcoholism is the cause of vomiting it would not be proper to give brandy or champagne to stop it, although "a hair of the dog that bit him" is sometimes a useful remedy.

In acute gastritis it is often necessary to stop mouth feeding for a day or two, merely allowing a little ice with Valentine's meat juice. But when the stomach is settling down a bit we can give albumin-water, lime-water, and milk or peptonized milk alternately. In meningitis and other forms of cerebral vomiting the patient will be able to take a larger quantity of albumin-water at a time ; indeed, they can often retain half a cupful of it when a smaller quantity of milk and lime-water would be rejected.

No matter what the cause of vomiting may be, the feeding must be begun on these lines. There are rarely cases where this method fails. There are for these two other modes of treatment—viz., washing out the stomach and rectal feeding. Washing out the stomach will do no good in cerebral or renal cases, but it may do much good in gastric and intestinal cases. Rectal feeding is useful in gastric, renal, cerebral, and other nervous cases ; but it is of little use in

intestinal cases. The "feeds" may consist of peptonized milk or peptonized milk with some glucose or extract of malt; raw egg and a teacupful of milk with a little salt, or beef-tea and glucose. Four "feeds" may be given in twenty-four hours at intervals of six hours. In long-continued vomiting thirst becomes distressing and may be relieved to some extent by the injection of a pint of warm water into the colon twice a day.

In addition to these modes of feeding, the patient must be kept absolutely still. Moving about will perpetuate the sickness; sitting up to vomit aggravates the condition; shaking the bed, turning from side to side will also make things worse. It is better to keep the patient on one side and use a small basin or napkin to receive the vomited materials.

As the stomach recovers, the diet must be gradually improved. When the stomach will retain a teacupful of milk and lime-water or barley-water, we can begin by giving some bland and unirritating substance such as Mellin's food, arrowroot and milk, Plasmon, Tilia, Sanatogen, junket, custard, and jelly. The quantity must be very small until the stomach will bear it comfortably. A teaspoonful of Brand's essence of beef or Mosquera's beef jelly will usually be retained when a cupful of milk and lime-water or peptonized milk is kept down. Mellin's food does not lay a tax upon the stomach, and Benger's food gives very little trouble to it. The advantages of Plasmon, Tilia, and other milk powders in sickness is that they do not form a curd; neither does junket form a curd in the stomach, it is already curdled and is soft and unirritating. When the stomach will bear these things an attempt can be made with a teaspoonful of soft-boiled egg and a mouthful or two of bread and butter. Then some light milk pudding may be given, and then we can go on to a teaspoonful or two of sole or plaice. The quantity of food must be slowly increased, and any attempt to give what the patient might consider "a proper meal" before the cause of vomiting had subsided would be almost sure to end in disaster.

VOMITING OF PREGNANCY.

The sickness of pregnancy is one of the commonest forms of "morning sickness". As a general rule morning sickness is due either to pregnancy, gastro-duodenal catarrh, or alcoholism. These conditions should always be in the mind when one is considering the origin of persistent vomiting. In married ladies there is usually no difficulty in arriving at a conclusion as to the first of these conditions. To begin with, the lady has missed one or two "periods" and is probably beginning to show other signs of her condition. The sickness generally commences at the beginning of the second month of pregnancy and terminates when the quickening occurs. It comes on as soon as she assumes the upright position, and the vomit usually consists of some glairy fluid. As a general rule there is no other vomiting throughout the day, and, the appetite being good, nutrition does not suffer. If this were all that was likely to happen we should have no need to draw attention to the subject. But unfortunately there are cases where the vomiting occurs throughout the day, and consequently the patient becomes emaciated and weak, and the prospect is rather threatening. Indeed the vomiting may be so severe and prolonged as to cause extreme danger, not only from starvation but from the general condition. The most dangerous cases are those in which the patient becomes restless, sleepless, has a fetid breath, and passes little urine. Sometimes the urine contains a little albumin; and, as the patient passes very little urine, the waste products of the tissue changes are retained in the organism, and bring about some degree of uræmia. Probably the temperature rises two or three degrees, and the mind becomes wandering. The danger is very great when the pulse rises to 120, and delirium and diarrhoea occur.

Vomiting of pregnancy is regarded as being reflex, as a general rule, due to the irritation of the nerves in the growing uterus. It may be expected to be rather severe in first pregnancies, presumably because the resistance of the uterus to expansion is greater than in one which has already borne several children. Again, it is likely to be rather severe in

the first pregnancy of young ladies who have been accustomed to experience a great deal of pain at their periods (dysmenorrhœa). Excessive vomiting also occurs in others who have suffered from displacements of the uterus, especially forward displacements ; and in those who have been neurotic.

When women have borne one or more children, the vomiting is generally normal ; but very severe and prolonged vomiting may occur when a previous pregnancy has resulted in chronic inflammation or ulceration of the neck of the uterus. The vomiting may then be due to the stretching and irritation of inflamed or ulcerated tissues.

In some extremely bad cases of vomiting in pregnancy called hyperemesis, the patient dies ; the post-mortem examination then reveals a degeneration of the cells of the liver or kidneys, or both. On this ground, therefore, we are compelled to the opinion that such cases are really different from any others, and that the degeneration of the liver and kidneys predisposes to the fatal result.

The treatment of mild, but ordinary vomiting of pregnancy is not difficult. It is important that the patient should have some food before getting out of bed. This gives the stomach something to do in the right direction, and may ward off the nausea, and will certainly reduce the exhaustion which is a disturbing element in the case. The avoidance of foods which are liable to cause indigestion is essential. Constipation must be treated. Perhaps a change of diet may be necessary on this account ; avoiding milk, milk puddings, white bread, and other foods which tend to constipate the patient ; and taking brown bread, oatmeal, treacle, jam, fruit, vegetables, and meat, which have the opposite effect.

In severe cases of vomiting, the patient must be kept in bed, and lie on her back or right side. Her food must be the same as for other cases of severe sickness. It must be given at very short intervals, and only a spoonful at a time. Milk, milk and lime-water, milk and bicarbonate of potash or one of the gaseous waters, e.g. soda-water, potash-water, Perrier or Apollinaris will be useful. Milk and barley-water are not to be despised, although the barley-water

contains very little nutriment. In extremely severe cases, ice, iced milk, albumin-water, iced champagne, brandy and soda, Valentine's meat juice, Brand's essence, Mosquera's beef jelly, Plasmon, Sanatogen, are all proper things to use. One thing must be tried after another. If they fail, we must resort to rectal feeding; but that can only be carried on for a few days. Sometimes the application of an ice-bag over the pit of the stomach, or to the back of the neck, will help to check the vomiting.

If the irritation ceases, and the stomach begins to retain food, we can give peptonized milk, peptonized milk gruel, beef-tea, Benger's or Mellin's food, Savory and Moore's food; and from this foundation we can gradually build up a diet consisting of light and nourishing articles, to be taken for some time before the patient returns to the normal dietary.

In some of the exceedingly severe cases it may be necessary for the doctor to relieve the uterus of its burden in order to save the patient's life. It is often necessary to resist the desire of the patient or the patient's friends for this operation to be done. The legality of the operation has always to be considered. As a matter of protection for himself, the medical attendant will probably request the opinion of somebody else before he does it. Perhaps the supervention of uræmia, convulsions, or delirium, may determine the necessity for it. In other instances a pulse of 120, a red, glazed, or brown tongue, considerable emaciation and great exhaustion are sufficient indications for the expediency of obtaining that mode of relief, and saving the patient's life.

VOMITING IN SICK HEADACHE.

Females are more prone to sick headache than males. The attack frequently comes on early in the morning. The patient gets out of bed feeling dull and indisposed for mental or bodily exertion; she looks heavy, dejected, and miserable. Then the headache begins, and after a time a sense of nausea supervenes which usually ends in a more or less severe attack of vomiting. If the patient has taken any food it will probably come back almost unchanged; if

she has not taken food, she usually brings up some mucus with great straining and retching, and finally the vomit contains bile, yellow or green, and occasionally streaks of blood. The headache attains its greatest intensity during the vomiting, which may be repeated several times. The patient cannot bear any light, or noise, or the least shaking of the bed, and is usually very prostrate and almost collapsed. After the vomiting ceases she will probably go to sleep and may wake up refreshed and feeling very nearly in her usual health.

As a rule no food or drink can be tolerated during the attack. The patient should be put to bed, the room darkened, and have some evaporating fluid applied to the head. An evaporating lotion, or plain spirit (gin) and water, answers the purpose very well; but most patients prefer eau de Cologne, eau de Florida, or other perfumed waters. Vinegar and water is not to be despised and its aromatic odour is very refreshing. Sometimes a tight bandage round the head gives relief, but more relief is obtained by pressure with the thumb over the temporal artery on the painful side. As soon as the patient can be induced to take anything, she should have a teacupful of very strong tea or coffee, some guarana (Brazilian cocoa), or a glassful of kola wine, all of which contain caffein, an alkaloid which is well calculated to relieve the pain and sickness, and at the same time act as a restorative. The treatment of sick headache should be carried on between the attacks. The cause must be sought. If it is due to constipation or duodenal catarrh it is a comparatively simple matter. But some of the cases, more properly called migraine, are not so readily cured. Nevertheless a large proportion of them are curable where proper steps are taken. The treatment usually includes a modification of the diet. In some instances it is advisable for the patient to abandon the use of meat entirely and live upon milk, eggs, white bread, cheese, oatmeal, potatoes, butter, green vegetables, and fruit. This is practically a purin-free dietary and must be persisted in for many months. In other cases a fruitarian dietary is valuable and, consisting of fruit and nuts, is considered more palatable than the former. But none of these diets should

be taken without medical advice, and the physician should arrange a diet sheet, in which the nuts and fruits are those which go well together. If this is not done the dietary may fail, not because it is of the wrong kind, but because the items are not arranged so as to form a properly balanced diet.

THE VOMITING OF BLOOD.

The term hæmatemesis or vomiting of blood is applied to bringing blood up from the stomach, no matter what the source may be. Hæmatemesis may be due to bleeding of the stomach or parts of the body somewhat remote from that organ. The blood may have been swallowed after the removal of teeth, tonsils, adenoids, from wounds or ulcers about the mouth or throat. Profuse bleeding of the nose may occur without obvious reason if the blood-vessels are diseased, and a large amount of blood may unconsciously be swallowed. Much blood may trickle down the throat when the base of the skull is fractured; but in such cases there is usually some circumstantial evidence of injury. In some cases of profuse hæmoptysis blood may be swallowed. If the hæmoptysis is due to tuberculosis there will probably be a history of cough and night sweats. But it might be due to the rupture of an aneurism of the aorta or some branch of the pulmonary artery, the hæmorrhage being profuse and usually fatal. The blood might also come from cancer of the gullet or an acute inflammation of that channel from the action of a corrosive poison.

Bleeding from the stomach itself may be due to a variety of causes. It may result from congestion of the vessels due to mechanical obstruction to the circulation from diseases of the heart or liver, which sometimes cause profuse bleeding. Very profuse bleeding of the stomach may also occur as the result of gastric ulcer, cancer, or corrosion of blood-vessels by the local action of powerful acids and other poisons. Slight bleeding of the stomach may occur in the course of acute gastritis, chronic gastritis, or cancer. Bleeding of the stomach may also occur in acute fevers, Bright's

disease, scurvy, purpura, and in that peculiar condition known as hæmophilia which exists in persons called "bleeders". It may also occur as the result of "vicarious menstruation"; this has been doubted, but it is an indisputable fact that women who have a deficient menstrual flow are liable to bleeding from the stomach and other parts of the body without obvious cause. Excessive vomiting from any cause may make the stomach bleed. Finally, blood may be vomited from the stomach of malingers who have actually swallowed it; and other fluids, coloured like blood, may also be swallowed and vomited by such people with the idea of obtaining pity and possibly exemption from duty.

It may be assumed, as a general rule, that bleeding from the gullet, stomach, or duodenum is attended by vomiting of blood, and that, with few exceptions, bleeding from any part of the bowels below the duodenum never gives rise to vomiting, but in such cases the blood is voided solely by the anus and gives rise to *melæna* or blood in the motions. Although it is the rule for bleeding from the gullet, stomach, and duodenum to give rise to vomiting of blood, it must never be forgotten that in almost all cases some of the blood passes into the bowels, and that in other cases there may be no vomiting, but all the blood passes through the bowels.

The recognition of blood in the vomit or faeces is not usually difficult. Vomited blood is generally of a dark colour, but is occasionally of a bright arterial tint, and it may be fluid or in clots. If vomiting does not occur immediately after bleeding the blood undergoes a change in appearance owing to the action of gastric juice upon it, when it acquires the character known as "coffee-grounds". Blood from the bowels may be of a dark chocolate colour or of a pitchy character. In doubtful cases, due to the small amount of blood, the aid of the microscope or chemical tests may be required. It is important not to confound the discolouration of the vomit due to wine, iron, bismuth and other drugs with that dependent on the presence of blood.

The symptoms arising from bleeding of the stomach naturally vary with the amount of blood lost and its cause. In acute febrile diseases, pyæmia, septicæmia, anæmia, the

bleeding is only a symptom adding severity to the primary affection, and it materially increases the gravity of the case. But when haematemesis occurs from an ulcer of the stomach, cirrhosis of the liver, or aneurism of a blood-vessel, definite symptoms occur. In these cases the haemorrhage not infrequently happens after some indiscretion on the part of the patient, such as the consumption of indigestible food, a drinking bout, or unusual exertion. Prior to the vomiting the patient suddenly feels faint, turns pale, and complains of a sensation of sinking or actual pain. Some patients fall down insensible or convulsed, or appear to be at the commencement of an epileptic seizure. In less severe cases the faintness is succeeded by coldness of the skin, perhaps a cold sweat, and a small, infrequent, and compressible pulse. These symptoms are due to the loss of blood. If the bleeding is slight there may be no vomiting, but if it is excessive or continuous, vomiting of blood usually occurs and the cause of the faintness is evident.

After the faintness and vomiting have passed away there is, in the majority of cases, a stage of reaction. While loss of blood leaves the patient bleached and the temperature depressed, the pulse now becomes full and bounding, but it is very soft and compressible, and eventually slows down. A tinge of colour also appears on the cheeks, and is in marked contrast to the marble-like appearance of the rest of the skin, and the patient may become restless and excitable. Bleeding from an ulcer of the stomach is rarely fatal immediately, nor is that from cancer; but when the bleeding is due to cirrhosis of the liver death may be very speedy.

The measures to be taken for the arrest of bleeding from the stomach are practically the same as those adopted for bleeding in other parts of the body. The very essence of such treatment is REST—local and general rest. This is obtained by putting the patient to bed and in the recumbent posture, avoiding all unnecessary movements, and guarding against mental excitement. The latter will require the exclusion of all friends from the room, especially “fussy” relatives, and permitting the presence of those persons only who are required to assist in carrying out medical instruc-

tions. Rest of the stomach is obtained by refraining from the administration of any food by the mouth, and by giving only those liquids which will assist in checking the bleeding and vomiting. The administration of stimulants by the mouth must also be forbidden. We may allow the patient to suck some ice or to drink ice-water, or other water which contains the drugs prescribed by the doctor. Alum-whey may be given in doses of one ounce every hour. It is made as follows: Take 1 pint of boiling milk; dissolve $\frac{1}{4}$ ounce of powdered alum in 2 ounces of hot water; mix it in the milk, stir; let it stand a few minutes and strain it. This is not only nutritious, but, being astringent, will assist in stopping the haemorrhage. But a large quantity of fluids cannot be allowed, because it would encourage vomiting, cause a recurrence of bleeding, and probably reopen a vessel which is already closed. Nature's method of arresting bleeding is to form a clot of blood in the interior of the injured vessel up to the nearest branch. To assist in bringing this about she endows the blood with the property of forming a blood-clot. Such a clot is formed first of all outside the blood-vessel—in this case it is formed in the cavity of the stomach; the clot so formed temporarily blocks up the gap in the blood-vessel, and by this means favours the formation of a blood-clot in the interior of the vessel. The object of our treatment is to encourage the formation of the clot in the interior, to prevent a clot so formed from getting dislodged by bodily movements or vascular excitement, and give it time to become firm. The application of an ice-bag or ice-poultice over the epigastrium will materially assist our endeavours.

The question arises as to what should be done to rally the patient from fainting. Unless it is a serious case of syncope or collapse, it is not advisable to use vigorous measures at first for fear of producing a too speedy reaction and causing the vessel to bleed afresh. By no means should stimulants be given by the mouth or the circulation stimulated by rubbing the extremities. Let the legs and feet be raised well above the level of the body by pillows or cushions, and the head kept low. Apply a damp cloth to the forehead and

temples, and let it be perfumed with eau de Cologne, eau de Florida, or sal volatile. If the patient is actually unconscious a bottle of smelling-salts may be applied to the nostrils, and half an ounce to an ounce of brandy with as much water injected into the rectum will be useful. These procedures will generally help the patient to rally, the recovery being indicated by a return of consciousness, an improvement of the pulse, and perhaps a little colour in the cheeks.

There are some cases where the bleeding is so profuse and the collapse or unconsciousness so prolonged as to necessitate the use of other measures. These consist of the transfusion of blood and injection of saline solutions. The former mode of treatment is rarely adopted. But the injection of saline solution is often practised and is an extremely useful measure. The solution most commonly used consists of two teaspoonfuls of common salt in two pints of boiled water, cooled down to 105° F. It is injected, or allowed to find its way by gravitation, through a large hollow needle or trocar inserted into the subcutaneous tissues of the armpit, the loose tissues of the breasts, or other parts of the body. The effect is often marvellous, and shows itself primarily in the improvement of the pulse and increased blood-pressure.

The foregoing account shows that vomiting blood may be due to many causes. But two chief causes are most often met with. These are chronic ulcers of the stomach and cirrhosis of the liver. The former occurs in young women, and there is a history of long-continued dyspepsia and anaemia prior to the bleeding. The latter occurs chiefly in males; there is probably dropsy of the abdomen at the time the haemorrhage occurs, and a history of chronic alcoholism. In both cases the haemorrhage is serious. But it is far more serious when it occurs in persons already debilitated by disease and may cause death. When the bleeding is due to cirrhosis of the liver some authorities recommend the use of purgatives to relieve the congestion of the portal vessels, but this is a dangerous practice, and contrary to the first rule for the treatment of bleeding—viz., REST.

When the haemorrhage ceases and the stage of reaction sets in sedatives may be required, and the continuance of

rest and quietude is absolutely essential. The feeding should be entirely rectal for a day or two if the blood has come from the gullet, stomach, or bowels. When stomach feeding is commenced the food will necessarily be light and of a kind easily digested, but the kind and the amount will depend upon the nature of the causative disease.

CHAPTER VII.

ACUTE GASTRIC CATARRH; ACUTE GASTRITIS.

THIS disease is commonly called inflammation of the stomach. As a matter of fact it is an acute catarrh similar to that which occurs in the nose. But the surface of the stomach is so much larger that it causes more severe symptoms and consequences. The causes of catarrh of the stomach are also similar to those which produce catarrh of the nose. A common cold in the head is due to exposure to wet and cold, extreme changes of temperature, influenza, and infectious diseases. It may also be due to powerful irritants, such as poisonous fumes and gases, or mineral poisons. In like manner catarrh of the stomach (acute gastritis) may arise from exposure to wet and cold, extremes of temperature, and infectious diseases. It is not uncommon for a cold in the head to extend to the bronchial tubes or stomach. But probably the most important causes of gastric catarrh are local irritants in the food which has been consumed. Thus it may be due to irritation by an excess of ordinary foods, by their indigestibility, or fermentation. Some foods contain special irritants, such as the ptomaines in unsound meat, fish, or cheese; or the salts of tin in canned fruit or vegetables. Spirituous liquors are a frequent cause of gastritis. Certain wines and other foods contain an excessive amount of acids which cause gastritis. And the disease may be caused by the accidental or intentional consumption of acids, alkalis, and mineral poisons, or exposure to powerful fumes and gases.

The symptoms of catarrh of the stomach vary according to
(46)

its severity. (a) In severe cases there is an intense burning pain in the stomach, radiating to the lower part of the chest in front and between the shoulders, with more or less rigidity of the abdominal muscles. The pain is aggravated by breathing. There is intense nausea, and the stomach rejects everything that is swallowed; where nothing is swallowed the patient vomits mucus and bile, often streaked with blood. These are the most serious cases, such as follow poisoning by corrosive sublimate, carbolic acid, ammonia, and other irritating substances. Such cases may properly be called inflammation of the stomach. The condition of the patient is serious, there is a tendency to collapse, and the case may end fatally in from four to six days.

The extreme irritability of the stomach contraindicates feeding by the mouth. Nevertheless the patient may have small pieces of ice frequently, some Valentine's meat juice being given with ice every hour, and small quantities of iced albumin-water may be given at intervals, with milk of magnesia or a bismuth mixture at stated periods. The patient must be fed per rectum if the vomiting continues more than twenty-four hours. The "feeds" may not be retained owing to a reflex irritation of the bowels; but something must be done, and that is the most rational thing to do. If the condition of the patient improves, the food and mode of feeding recommended below will be applicable to the case. It is also necessary to apply some local application. Whether this should be hot or cold must depend on the sensations of the patient. The sensation in the interior of the stomach is sometimes described as being "like a red-hot coal". If the heat is so intense it is probable that poultices or mustard plasters applied to the exterior would not moderate it. A cold lotion, such as eau de Cologne and water, or the ancient and useful evaporating lotion would be more useful and better appreciated. An ice-poultice, consisting of pounded ice between two layers of old flannel, an ice-bag, or Leiter's tubes would also be more soothing than poultices.

(b) In sub-acute gastritis, or those cases which are more properly called acute gastric catarrh, the symptoms are less

severe and the consequences more seldom fatal than in the former type of the disease. It is a common result of alcoholism, the consumption of high game, mushrooms, ptomaine poisoning, exposure to wet or cold and other atmospheric influences. The symptoms of this type may also vary according to its severity. The pain may be acute—a sensation of burning, or merely excessive warmth in the stomach. There may be a craving for food which, moreover, fails to relieve the pain, and may aggravate the nausea and vomiting. The material brought up from the stomach consists of tenacious ropy mucus, mingled with the substances which have been swallowed, and bile or streaks of blood.

In the treatment of these cases ice is extremely useful. It helps to allay the irritation and check the vomiting. As regards food, the stomach must have a rest. But a few articles are useful to assist in subduing the irritability of the stomach. These consist of mucilaginous materials and alkaline waters. Among the former are white of egg, isinglass and milk, barley-water and milk, tragacanth and milk, decoction of Iceland or Irish moss and rice-water. All these substances have the experience of ages to recommend them. Milk should never be given alone, but should be diluted with half or two-thirds of one of these liquids. Irish moss jelly is made as follows: Take a quarter of a teacupful of Irish or Iceland moss, one pint of milk, and a pinch of salt. Soak the moss in water for a few minutes, wash it, and carefully pick it over. Put it into a muslin bag, and boil it with the milk in a double pan until the liquid thickens when a few drops are poured on a plate. Add the salt, remove the bag, press it and pour the milk into a mould. It will set on cooling. It may be eaten cold; or made liquid by dissolving it in an equal quantity of hot water and again allowed to become lukewarm. Isinglass and milk is prepared in a similar manner. Both these preparations are soothing to the stomach. White of egg should be mixed with lemon-water. Rice-water is prepared by boiling rice in water until it is thoroughly cooked and straining the liquid away; it should set into a thin jelly.

The alkaline liquids are very useful; the combination of

carbonic acid gas and alkali is soothing to the inflamed surface of the stomach, it checks nausea, and assists in controlling vomiting. Soda-water, potash-water, lithia-water, Perrier and Apollinaris water are the kinds usually recommended. The great advantage of milk of magnesia or bismuth is that the metal becomes deposited upon the mucous membrane and acts as a local sedative to the stomach.

It is extremely doubtful whether any form of meat juice, meat extract, or other substance derived from meat ought to be given in the acute stage of the disease; because all these things stimulate a secretion of the gastric juice, which is undesirable at this stage of the disease. Nevertheless, it is usual to prescribe Valentine's meat juice, Brand's essence of beef, or Mosquera's beef-jelly with ice, small quantities only being given at a time.

Milk should never be given in an undiluted form to these patients, because it forms hard curds which cause pain, increase the vomiting, and otherwise are injurious. But if it is given with half or two-thirds of barley-water, rice-water, tragacanth-water, or isinglass, the curds formed by the milk will be small and soft, and they will be usefully employed in fixing the gastric juice which is secreted. The presence of alkalis, such as lime, soda or potash, neutralizes the acid, and thereby prevents the irritation due to the presence of gastric juice. But alkalis do more than that; they lessen the toughness of the mucus, and assist in its evacuation; they moderate the congestion of the mucous membrane, and sooth the irritability. Vichy or Vals water is often prescribed with these objects in view. But no fluid should be given in large quantities at a time. If the vomiting is very persistent it may be necessary to confine our attempts at feeding to giving a teaspoonful only of these substances every quarter of an hour, with a small piece of ice in between. Other patients may be able to take an ounce of fluid every half-hour, with a little ice and meat essence or jelly between. When liquids are rejected a teaspoonful of moss jelly or ordinary jelly may be retained. If milk and barley-water or other mucilaginous fluids is returned some

Plasmon or Tilia might be tried. If the vomiting lasts more than twenty-four hours, rectal feeding should be resorted to. A mustard-plaster over the region of the stomach may check the vomiting by acting as a counter-irritant.

When the irritation of the stomach has subsided other foods may be cautiously given. One of the most bland and least irritating foods is junket. It is palatable, soothing, and absolutely free from anything which can disturb the stomach. A junket-tablet dissolved in a tablespoonful of cold water and added to a pint of lukewarm milk will make a smooth, soft, and delicious jelly in ten or fifteen minutes, which is ready for consumption as soon as it is cold. It may be flavoured with sugar and a drop of essence of lemon or vanilla, or a little extract of meat or beef-juice. Similar remarks apply to egg-custard; but this is more solid than junket and requires longer digestion owing to the coagulation of the egg. Jelly of almost any kind would now be agreeable to the stomach.

As soon as we know that the stomach will bear these articles very well we can begin to give others of a higher nutritive value and increased solidity. But the ancient rule of making haste slowly (*festina lente*) must be resolutely adhered to. The patient may desire more substantial food, and if it is allowed to be consumed too early there will either be a relapse of the acute symptoms or the disease will pass into the stage of chronic gastric catarrh. This is the period when Benger's Food and others which are partly predigested are of value to the patient. These foods should therefore be given: while affording additional nutriment to the body they do not greatly tax the stomach. Mellin's Food is a useful material for such cases.

(1) The following is a recipe for an unirritating food:—

Mellin's Food	1 tablespoonful
Cream	2 tablespoonsful
Milk	$\frac{1}{2}$ pint
Two eggs; a pinch of salt.	

Beat the eggs, salt, and cream together; add the milk, and place it in a double pan or in a basin over a pan of boiling

water. Stir constantly until the mixture thickens a little; take it from the fire and continue to stir it for two or three minutes longer. Then add the Mellin's Food, previously dissolved in a little hot water. Mix all together; sweeten with sugar if it is desired, and add a teaspoonful of brandy or a tablespoonful of good sherry.

(2) The yolk of the eggs may be used alone if it is not heated, and more Mellin's Food can be added. Dissolve two tablespoonsful of Mellin's Food in a teacupful of warm water; beat up the yolk of two eggs, stir them into $\frac{1}{4}$ pint of milk, with a teaspoonful of brandy or a tablespoonful of sherry, or salt to make it palatable, and mix all together. This mixture should not be boiled, and it is not so thick as the former.

(3) The food may be made into a jelly: Take $\frac{1}{2}$ pint of milk, $\frac{1}{2}$ ounce of gelatine, one egg, a large tablespoonful of Mellin's Food, a tablespoonful of sugar, and a pinch of salt. Put the milk and gelatine into a double pan or a basin over a pan of boiling water, and stir until it is dissolved. Let the yolk of the egg be beaten; pour the mixture over it, and stir steadily; return it to the stove; add the salt, sugar, and Mellin's Food dissolved in a small amount of water. When the mixture thickens stir into it the white of the egg, previously whipped; pour it into a mould until it is set.

As the stomach regains its normal condition other articles of food may be taken. A cupful of chicken or veal broth, a poached egg, or a little bit of steamed sole or plaice may be tried. But we must not "force the pace"; let the stomach have time to recover from its indisposition. The patient can live on milk foods, and it will be better for him to be satisfied with them for some time longer, rather than to incur the risk of a relapse or of transforming the sub-acute and transient condition into the more durable or permanent chronic gastric catarrh. A few more recipes for foods useful at this stage of the disease may here be given.

(4) *Chicken or Veal Cream.*—Take $\frac{1}{2}$ pint of chicken or veal broth, $\frac{1}{2}$ ounce of gelatine, and a breakfastcupful of Savory and Moore's Best Food. Let the food be prepared accord-

ing to the usual directions. Make the broth hot and dissolve the gelatine in it; strain it into the food; add a tablespoonful of cream, and sufficient salt to make it palatable (but no pepper or other heating condiment), and pour it into a mould to set.

(5) *Blancmange* can be made by dissolving $\frac{1}{4}$ ounce of gelatine in $\frac{1}{2}$ pint of Savory and Moore's Food prepared in the ordinary way. It can be flavoured with a tablespoonful or two of strong coffee, chocolate, sherry, or fruit juice.

(6) *Batter pudding* is usually made with ordinary flour, but for persons who suffer from sub-acute gastric ailments, flour which has been partly dextrinized by heat or partly digested by pancreatic ferments is preferable. We have at our disposal many invalid foods of this character. Take a tablespoonful of Savory and Moore's Food and a tablespoonful of flour; mix them in a basin. Break an egg into the flour and thoroughly mix it, at the same time gradually add $\frac{1}{4}$ pint of milk, and continue to beat it for a few minutes. Pour it into a buttered cup or basin, cover it with a piece of buttered paper, and steam it gently for half an hour.

When it is known that the stomach bears these things very well, we can advance a stage farther. Milk puddings may be taken in greater quantity, especially sago and tapioca puddings made with eggs. Sole, plaice, whiting, and fresh haddock, or turbot with a plain milk sauce and a tablespoonful of mashed potato, may be taken daily. It is better for the potatoes to be mashed by being put through a wire masher rather than to be pounded with a pestle; the former method makes them very light and digestible, the latter forms a close pasty mass which is not so permeable. A small amount of spinach, vegetable-marrow, or purée of cabbage may also be taken. A few days later some breast of chicken, pheasant, or guinea-fowl may be eaten; also some stewed prunes or apple-sauce and custard, bread and butter, and weak tea. On the following day some roast mutton may be tried. Thenceforward, if these foods have agreed with the patient, any light articles of food may be taken. But the patient should be warned that dietetic sins

are as certain to bring their own punishment as other sins: that if improper foods be consumed by him a penalty will follow, and the consequences of such improprieties may be serious and followed by lifelong misery. It especially behoves these people to avoid high game, pickles, sour fruit, alcoholic liquors, excess of sweets, pastry, sausages, and other spiced foods. If care is exercised in the final treatment of these cases the stomach may return to its normal condition. But if the patient is careless about his diet, which may happen through ignorance of its importance, the condition will gradually pass into chronic gastric catarrh with hypochlorydia, atony, or loss of the motor power, and finally dilatation of the stomach. The consequences of such carelessness should, at any rate, be pointed out to the patient, and continual care should be exercised if these dire consequences are to be avoided.

Gastro-intestinal Catarrh in Children.—Children of all ages are liable to gastric disturbances. These are sometimes, but not always, due to the food. Infants are very sensitive to atmospheric changes: heat, cold, damp, bad ventilation, and noxious gases easily upset them, and they are prone to catarrh of the stomach and bowels from these causes. Moreover, their stomachs are very liable to irritation by improper food or irregularity in the time of feeding. Breast-fed children are less often subjected to irritation from this cause than bottle-fed children. But it has been shown again and again that a temporary deficiency in the quality of the mother's milk or irregularity in feeding may cause acute indigestion. Bottle-fed children are very liable to have their stomachs upset by irregularities in the quantity or quality of the food. The indigestion thereby induced is very prone to end in an attack of acute or chronic catarrh of the stomach and bowels. Indeed, this is the most common disorder of the digestive system in children. They are very prone to such attacks during the period of teething. As the children get older gastro-intestinal disorders are less frequent, and when they do occur they assume more and more the type of disease which occurs in adults.

The most prominent symptoms of this disease in young

children are vomiting and purging, the former being the most prominent symptom when the stomach is chiefly attacked, and the latter when it principally affects the bowels; but in many cases a considerable portion of the gastro-intestinal tract is affected, and therefore both symptoms are present. In the purely gastric form of the disease, the infant vomits the food as soon as it is taken. It is returned in an undigested form with a watery fluid, consisting partly of whey and partly of gastric secretion. The tongue is red or coated with a white fur. The bowels are confined, the motions are hard, deficient in bile, and clay-coloured. The child cries owing to the occurrence of griping or spasmodic pains. The abdomen is swollen and tender. And the temperature shows that the general condition is more or less febrile. In the intestinal form the motions are loose and contain undigested food—*e.g.*, curds of milk, and mucus, and smell badly. In the combined gastro-intestinal variety of catarrh, diarrhoea replaces the constipation.

The treatment of this disease in bottle-fed babies and older children consists of rest of the stomach, and the administration of albumin-water (white of egg and lemon-water), barley-water and cream, with, perhaps, a little milk, lime-water and milk, rice-water, and other mucilaginous drinks. It is sometimes necessary to abstain entirely from giving milk for a few days, but whey or buttermilk can be given. The former can easily be prepared by using junket tablets to set the milk, afterwards breaking it up and straining off the whey through a piece of muslin or butter-cloth. Buttermilk is usually only obtainable from a dairy farm. It is less difficult to prepare a mixture of milk albumin from commercial preparations such as albulactin, a teaspoonful of which may be given, with an equal quantity of sugar and a sprinkle of salt, in half a teacupful of boiled water, at the temperature of the blood. The child should be given a small quantity of any of these liquids every half-hour. They will quench the thirst, soothe the irritable mucous membrane, check the vomiting and purging, and materially assist in curing the disease. If the child is more than six months old we can now try the effects of some Benger's Food in addition to the foregoing. If

these agree with the patient we may gradually build up a dietary of milk, Benger's Food, lightly boiled eggs, a small amount of scraped meat, some raw meat juice and veal broth. The return to the ordinary diet, even in older children, must be very gradual, and indiscretions in feeding must be carefully avoided.

CHAPTER VIII.

CHRONIC GASTRIC CATARRH; CHRONIC GASTRITIS.

As a primary disease, chronic gastric catarrh is due to the same causes as the acute form. It is a common consequence of influenza and the fevers. It may also follow an attack or recurrent attacks of acute gastritis; and the innumerable causes of indigestion by their persistence very frequently lead to chronic gastric catarrh or catarrh of the stomach. Acid foods and such as undergo acid fermentation in the stomach are among the commonest causes of this complaint. Sugar gives rise to acidity. Starch (in bread, rice, oatmeal, sago, tapioca, etc.) does not give rise to acidity while the gastric juice and motor activity of the stomach remain normal, because it escapes through the pylorus without any change. But if the motor power of the stomach is defective there is a delay in the passage of starchy foods into the bowels, and they undergo fermentation which results in the formation of acids having an irritating character.

Butyric acid arises during the fermentation of starch and sugar in the stomach. It is one of the most irritating acids. It should be pointed out that this acid occurs normally in butter. Good butter contains but little, but cheap butter and that which has become rancid contains much more. Cheap butter is very often used for cooking purposes; this is wrong in principle, and it is a very common cause of catarrh of the stomach. The flavour of rancid butter may be hidden by mixing it with flour and the other ingredients of cakes and pastry, but the butyric acid is not destroyed thereby. Acetic acid and lactic acid are also formed in the stomach, but they are more often taken in the food. Acetic acid

occurs naturally in vinegar and pickles, lactic acid in sour milk and foods made with it. Tartaric acid, acetic acid, malic acid, and many others occur in fruits and wine. Spirits act as local irritants to the stomach, and some of the alcohol may be transformed into acetic acid. It may, therefore, be said that primary chronic catarrh of the stomach arises from improper feeding, habits of intemperance, and accidental causes.

But it is probably as a secondary affection that chronic catarrh of the stomach will most often be met. It complicates very many diseases, but especially results from congestion of the portal veins (the venous system of the abdomen), diseases of the liver, affections of the heart, lungs, and pleura. Take the flabby and enfeebled heart of an elderly person as an example. In such a case the circulation is very feeble, the abdominal veins become engorged with blood because the heart is unable to keep it in circulation, and thereby leads to passive congestion of the liver, and of the mucous membranes of the alimentary canal, with catarrh thereof and its attendant evils.

The cause or causes of acute catarrh of the stomach are very often local, and the intensity of the irritation secures the removal of the irritating substance by vomiting. In chronic catarrh the irritation is far less intense, but the long-continued irritation or passive congestion produces equally serious results. The changes caused thereby are no less because they are produced gradually. The mucous membrane of the stomach becomes thickened, the submucous and muscular coats hypertrophied. The mucous membrane is covered with a thick and tenacious mucus; when this is removed it appears paler than usual, possibly with varicose veins here and there; it may be thrown into irregular folds or be marked here and there by slate-coloured patches resulting from slight extravasation of blood.

The patient complains of pain and tenderness at the pit of the stomach, or it may be a sensation of weight, of gnawing, or cramp at the stomach. These symptoms are perceived most frequently in the morning, that is, when the stomach is empty. There may be sickness in the morning; the vomit consists of saliva swallowed during the night, and

perhaps a tasteless transparentropy mucus, somewhat like the white of an egg, containing the bacteria and fungi which cause fermentation and acidity. But vomiting is not a constant symptom of the disease; some people never vomit, others only vomit occasionally and after some indiscretion in the diet. The tongue may be coated with a white or creamy fur through which the enlarged papillæ are visible; in other cases it is red and the enlarged papillæ are as visible as in the "strawberry tongue" of scarlet fever. The lips are often dry and cracked, the gums spongy and discharging. In addition there are the usual symptoms of indigestion. The general condition is that of "being out of sorts," the patient is listless, languid, unable to make any exertion, or is easily exhausted. The nutrition of the patient fails because the gastric juice is deficient in hydrochloric acid, which is one of its normal and essential constituents, and in very serious cases the pepsin is also deficient in quantity.

The disease runs a very extended course. The symptoms may be very much improved by treatment, but they recur on very slight provocation at intervals of months or years. Most cases of primary gastric catarrh are curable by careful and persistent treatment and attention to the food. But secondary gastric catarrh is dependent on the causative disease, and the variations in the catarrh usually go hand in hand with variations in the disease which has occasioned it. Thus the gastric catarrh arising from passive congestion may be considerably relieved by an improvement in the condition of the heart, lungs, or liver. Nevertheless, the chronic heart, lung, or liver disease persists, consequently the stomach gets worse year by year, and the body suffers as much from the imperfect digestion and absorption of food as it does from the enfeebled heart or difficult breathing.

In these cases the food is of paramount importance. But patients vary so much in their condition that no stereotyped diet will suit them all. Everything depends on the ability of the stomach to digest its contents and propel them into the bowels. All kinds of food which are capable of being digested without unduly burdening the organ and of being propelled into the bowels in a reasonable time are proper

foods for the patient. It should not be forgotten that in this condition the digestive powers are feeble, and most foods require a longer time for their digestion than in a normal stomach. There must be rules for such cases, beginning with the mouth. The teeth must be carefully attended to ; the deficiencies should be made good. Artificial teeth which do not remain in the place intended for them should be thrown aside, and proper fitting ones obtained. The mouth should be kept clean and as free as possible from infection. Sore gums should be healed and hardened by the regular use of a proper mouth-wash. The patient should never break his fast without previously washing his mouth and cleansing his teeth. The food must be slowly and carefully masticated. It should be of such a kind and quality that it will suit the morbid condition of the stomach. The harmonious action of the alimentary canal must be promoted. The patient should rest a short time before a meal and a longer time after it. The function of digestion should be promoted by reasonable exercise of the body, suited to the strength and condition of the patient.

In mild cases of chronic gastric catarrh there should be no special limitation of the amount of food. It must, however, be of the right kind and quality. In the majority of cases the articles permitted are the same as in ordinary cases of indigestion. The meals should be as follows :—

Breakfast.—Eggs lightly boiled or poached. Fish of the light kinds previously detailed. Dry toast, rusks, or pulled bread, and a trace of butter. Milk-tea (China tea infused in milk instead of water), or cocoa made with milk.

Lunch or Midday Meal.—Lamb or mutton free from fat, mashed potato ; white bread or biscuit ; rice, sago, or tapioca pudding. A glassful of Burgundy or Bordeaux wine diluted with aerated water.

Tea.—A cupful of China tea with plenty of milk ; one slice of bread and butter, and a piece of sponge or Madeira cake.

Dinner or Evening Meal.—No *hors-d'œuvre* or soup. Fish, any light kind ; tender beef, mutton, or lamb, free from skin and gristle ; breast of fowl, pheasant, or turkey ; potato,

mashed and creamed ; spinach, seakale, asparagus, vegetable marrow, tender green peas, kidney beans, or cauliflower ; white bread or plain biscuit ; custard, junket, jelly, milk pudding, stewed fruit, wine and aerated water.

The patient should have three meals a day, with just a cup of tea and a bit of bread and butter at 4.30 P.M. Butter must be eaten very sparingly because it contains butyric acid. Fats and fat meat should be taken in the strictest moderation because they check the secretion of gastric juice. One need scarcely say that this applies to fat ham and bacon as well as to foods cooked in fat. Certain fish should be avoided because they contain too much fat or because the bones and scales cannot be easily removed. These include sardines, herrings, mackerel, eel, and salmon. Pork, duck, goose, and turkey (except the breast) are also too rich in fat. The patient must be particular to remove every particle of skin and gristle from all kinds of meat, fish, or fowl. He must avoid "high" game, tinned meat or fish, entrées, spiced meat, sausages, pork pie, etc. He must not eat pastry, brown bread, oatmeal porridge, sweet biscuits, and cakes containing currants, raisins, lemon peel, or seeds. Stewed fruit may be eaten with plain, unsweetened biscuits, *e.g.* "butter puffs," cracknel, or water biscuits. Fruit containing much acid must be avoided. But it is equally important to avoid those containing seeds, *e.g.* currants, gooseberries, cranberries, strawberries, grapes, and figs. Seedy fruits may be rubbed through a sieve. Acid fruits may be cooked with some bicarbonate of soda to neutralize the acid. The soda not only neutralizes the acid, but it necessitates the use of a smaller amount of sugar, which is also of importance, because an excess of sugar causes a profuse secretion of mucus by a catarrhal stomach. Raw apples, pears, and all kinds of nuts are taboo, but a ripe banana, the pulp of an orange which can be scraped with a spoon, and a ripe plum or two may be eaten ; grapes can be eaten if care is taken to remove the seeds and skin. Pickles, salads, and raw vegetables should be forbidden, especially cucumber, radishes, onions, lettuce, and watercress, but a ripe tomato which is free from seeds may be eaten.

Beverages.—The patient should eat without drinking ; any liquid which he may have should be taken at the end of a meal, preferably about half an hour afterwards. The best beverages are plain water, China tea, thin cocoa (van Houton's, Cocoatina, or Cocoa nibs), whey, buttermilk, Perrier, Apollinaris, Salutaris, and other gaseous waters.

Many patients have been accustomed to take some alcohol daily. It would probably be useless to forbid them to take any at all, they cannot easily give it up. Moreover, some patients with chronic gastric catarrh are benefited by taking a small amount of alcohol, if it be of the right kind and quality. They must not take ale, beer, stout, porter, sweet wines, or spirits. But they may have a wineglassful of Burgundy, Bordeaux, or red Hungarian wine, diluted with an alkaline or gaseous water, at the end of the midday and evening meals.

The use of alkaline waters is strongly recommended, especially those of Vichy, Vals, Plombières, Ems, Carlsbad, Marienbad, and the waters of Harrogate, Bath, and Leamington. They should be taken warm, but not very hot. They cleanse the mucous membrane, remove tenacious mucus, neutralize acidity, and check fermentation. They thereby stimulate the mucous membrane and promote the activity of the muscles of the stomach. Residence at the source of these waters is frequently recommended for the cure of gastric ailments. Some patients may require a stronger alkaline water as an aperient. The waters of Püllna, Condal, or Rubinat are recommended for that purpose. They cause a free evacuation of the bowels, and relieve the congestion of the abdominal veins.

More Serious Cases of Chronic Gastric Catarrh.—Some cases require more careful dieting than the former, and various modes of dietetic treatment have been adopted. They must therefore receive some consideration. Two important indications arise during the course of the disease which assist us in deciding upon the kind of diet which is most suitable. One point is the fermentation which so commonly occurs in the stomach and the irritation arising from the products of the fermentation. Sugar not only

irritates the stomach by its local effect, but it may undergo fermentation and give rise to acidity. The starches in all cereal foods also undergo fermentation and produce acids. Butter contains such an acid ready formed. The other point is : the deficiency of hydrochloric acid in the gastric juice. This deficiency leads to considerable delay in the digestion of meat, fowl, fish, and all other substances which are called protein foods. The normal proportion of hydrochloric acid in the gastric juice is sufficient to act as a germicide or disinfectant. But when the proportion of this acid is deficient the bacteria and fungi which cause the fermentation of the food flourish amazingly.

Let the last point be considered first. The patient must have some proteins regularly. If his food contains none he draws the necessary supply from his muscles, and this piecemeal removal of the muscles leads to a rapid enfeeblement of the body and other consequences, which are more unpleasant than merely wasting away. The amount of proteins usually considered necessary is 100 grammes (approximately $3\frac{1}{2}$ ounces) a day. But Chittenden has shown that we can live on half that amount, and it is now usually accepted that 80 grammes a day is enough for a man or woman who does no manual labour. A diet consisting of 4 pints of milk a day would contain 84 grammes of protein. Some physicians therefore treat their bad cases of chronic gastric catarrh by keeping them in bed and giving them a milk diet for two or three weeks. It is given in tumblerful doses every two hours from 7 A.M. to 11 P.M., and an extra glassful in the night, making altogether ten tumblersful. It is a remarkably good method of treating some cases, especially when the disease is due to alcohol. The patient does not like it at first, but he soon becomes accustomed to it, and gets well in a moderately short period of time. But it does not agree with everybody. If it does not appear to be borne very well, let some bicarbonate of soda or potash be put into the milk. This will neutralize the acidity of the stomach, and prevent the formation of large and hard curds. If it does not agree in this form the milk should be fortified by the addition of dried milk powders, such as

Plasmon, Tilia, or Sanatogen, and then reduced to its proper bulk by mixing with it some Perrier, Apollinaris, soda-water, or other gaseous water. If this does not agree with the patient we can fall back upon peptonized milk or soured milk, the latter being prepared by tablets containing the lactic-acid ferment. When opportunity occurs the treatment can be carried out by giving whey or buttermilk to the patient. They are exceedingly useful, and have this advantage: they do not form large curds in the stomach, but light and flocculent curds, and they contain a minimum of fat. A generation ago Niemeyer strongly recommended buttermilk for the treatment of chronic gastritis; he wrote thus: "When the patient is hungry let him eat buttermilk; when he is thirsty let him drink buttermilk". But the proteins may be derived from carefully cooked fish, fowl, tender meat, and poached eggs, and some farinaceous food must then be given to replace the sugar which exists in the milk. As a general rule these foods should consist of Benger's Food, or other invalid's food, fine oatmeal—baked until it is like biscuit powder—arrowroot, blancmange, and sago or tapioca pudding, all of which are made with milk, and a small amount of dry toast or torrefied bread. Too much farinaceous food should not be allowed, because it may lead to fermentation and thereby aggravate the condition which we wish to improve. The persistence of flatulence, heart-burn, and acidity would be considered a sufficient indication to reduce the amount of these foods or to put the patient on a milk diet with some meat or fish.

The second point has been partly considered in the foregoing. But while the digestion of proteins in the stomach is defective owing to the diminution of hydrochloric acid, the digestion of farinaceous foods may be perfect. This suggests that the diet should contain more farinaceous food and less protein. With this mode of treatment the ordinary animal foods should be abstained from. Milk and milk powders may be given. Benger's, Savory and Moore's, Mellin's, and other farinaceous foods will be valuable. Therefore the patient should be kept on these foods for a few days. The recipes given for these foods in the treat-

ment of acute gastric catarrh may be usefully employed. Iceland moss jelly, agar-agar jelly, and ordinary jellies, if not too sweet, will soothe the stomach and be suitable food. Sugar must only be used very sparingly because of its influence in increasing the mucous discharge. Butter and cream should be avoided, not only because of the acidity of the former, but because they check the secretion of gastric juice. After a few days we may cautiously add to the diet a poached egg or a little steamed fish (sole, plaice, whiting, or fresh haddock). If these are borne without pain or discomfort we may, in another day or two, give some scraped meat, chicken panada or souffl  , and any other meat which has been passed through a mincer or sieve. After these we can give in rotation, mashed potato, spinach, vegetable marrow, or some vegetable pur  ; and, finally, the breast of chicken, guinea fowl or pheasant, tender mutton, and under-cut of beef.

The fermentation of food by yeasts, fungi, and bacteria is considered by many authorities to be far more important than the deficiency of hydrochloric acid in the gastric juice, although the latter is acknowledged to be the main reason for the constant fermentation. These authorities therefore allow very little carbohydrate (starch and sugar) during the treatment. Leube gives the following course of treatment :—

(a) The diet should consist at first of clear soup or broth, solution of meat, milk, eggs—boiled or raw—and plain or aerated water.

(b) After a few days he adds boiled chicken, calves' brains, and boiled milk and bread.

(c) At a later stage he adds a small amount of bread and butter, and some scraped beef-steak, quickly cooked and underdone.

(d) Finally, he allows ordinary beef (underdone), roast chicken or partridge, macaroni, cooked green vegetables or fruit, and a small amount of wine.

Leube's solution of meat is prepared as follows: Mince 2 lb. of plain meat, place it in a porcelain vessel (a glass jar will do as well) with $1\frac{1}{2}$ pints of water, and add $\frac{1}{4}$ ounce of pure hydrochloric acid. Place this vessel into a pan of

water and boil it for ten or fifteen hours. It should now be turned out of the vessel and rubbed down to a paste with a pestle and mortar, returned to the vessel, and the latter put back into the pan of water and boiled again for fifteen or twenty hours. The substance should now be neutralized by the addition of 1 ounce of bicarbonate of soda, which will convert the hydrochloric acid into common salt. It should then be evaporated in a saucepan on the hob until it is of a syrupy consistency. This food is now ready for use. It may be given in doses of 2 ounces. It is almost ready for absorption and requires scarcely any digestion in the alimentary canal. It should be taken luke-warm; a little salt being added if necessary. It is an extremely useful food for cases of chronic catarrh, ulcer, or cancer of the stomach.

Lavage of the stomach is a valuable aid in the treatment of this disease. It should be done each morning before breakfast. When it is done at home the solutions used generally consist of bicarbonate of soda and common salt, boracic acid, or permanganate of potash. At the various Spas the water of the district is used alone. All these liquids should be used at a moderate temperature. By means of lavage the mucous membrane is cleansed and refreshed, mucus and food residues are removed, bacteria and fungi are washed away, the circulation through the blood-vessels is improved, and the muscles stimulated to activity. If the patient refuses to have his stomach washed out daily, he should be encouraged to take an emetic at least once a week, and thereby produce the effects of lavage in a minor degree.

A moderate degree of exercise is essential for all patients who can take it. Golf is useful for both men and women. If they are unable to take exercise of this character they must be encouraged to walk for half an hour twice a day. They may also exercise their arms, back, and abdominal muscles by the simple exercises taught to school children. Those persons who suffer from cardiac debility may be taught to do the Schott exercises as practised at Nauheim.

Change of air is likewise beneficial. A warm, moist air

is useful in some cases, a drier atmosphere in others. This is a matter which the medical attendant must carefully consider; a warm, moist climate being suitable for the debilitated and aged; a drier climate for those who have passive congestions and copious discharges from the mucous surfaces; and a dry bracing air for those who have a relaxed state of the system generally, especially when combined with neurasthenia. He will know best whether the patient requires a moist air like that of Devonshire, the drier air of Bournemouth, Brighton, Algiers, or Egypt, or a cool and bracing air like that of Harrogate, Ilkley, Buxton, Matlock, or Malvern. Each of these climates is considered good for chronic gastric catarrh, but the constitution of the patient and the nature of the primary complaint will make one place more suitable than another for each individual case.

CHAPTER IX.

ACID DYSPEPSIA.

THERE are two forms of acid dyspepsia. In one the normal acid of the gastric juice (hydrochloric acid) is in excess ; in the other various organic acids present in the food or arising from fermentation give rise to acidity of the stomach and other symptoms of dyspepsia. These cases usually only come under treatment when the dyspepsia has lasted a long time, and is more or less chronic. To find out what is the exact nature of the trouble the physician should prescribe a test meal, the contents of the stomach being afterwards removed by a stomach tube and analysed. One of the meals commonly used for this purpose consists of a roll or 2 ounces of stale white bread and a breakfastcupful of weak tea or hot water. The meal is taken early in the morning, and the contents of the stomach drawn off about an hour afterwards, that is to say, when the digestion is at a height. The material is filtered, and reagents, which reveal the amount and kind of acid, are added to it.

If the condition of the stomach were normal these test meals and the subsequent analysis would be unnecessary. The acidity of the gastric contents would be normal. The consumption of food would be a pleasant and agreeable task, followed by a sensation of comfort and well-being. But such an examination being called for proves the existence of some abnormality.

Where the analysis shows that the hydrochloric acid of the gastric juice is in excess, the abnormality is what is known as *Hyperchlorhydria*. The gastric juice is too free and too strong ; the secretion begins too soon after the

meal and is excessive. In the normal condition, saliva is mixed with the food during mastication and continues to act on it after it reaches the stomach. Fully half an hour elapses after the food is swallowed before the secretion of the stomach is sufficiently acid to check the action of saliva. But in the condition of hyperchlorhydria free acid appears about ten minutes after beginning to eat, and the digestion of starch in the stomach is thereby prevented. This abnormal condition occurs in about half the people, between the ages of twenty and forty-five years, who suffer from indigestion. It is the condition which occurs in the student working hard for an examination, in the man who applies himself strenuously to business, the hard-working clerk, lawyer, accountant, or busy shopkeeper. But it is not merely strenuous application to duty which causes the trouble. It may be brought on by grief, worry, and anxiety; by gobbling the food without proper mastication; hurrying from business to meals and meals to business; it may be due to the local irritation caused by acid foods, heating spices and condiments, excess of alcohol and abuse of tobacco, and sometimes by other gastric diseases. Summed up briefly, the cause of hyperacidity is an irritation of the gastric mucous membrane, and its technical sign is the discovery of an excess of hydrochloric acid in the gastric contents at the height of digestion.

In such persons the digestion of protein foods (meat, fowl, fish, milk, etc.) is perfect, and their presence in the stomach relieves the symptoms by taking up the excess of acid as it is secreted. But starch and all foods containing it (bread, cakes, puddings, etc.) are not digested so easily as usual, and their detention in the stomach is often delayed, especially when the acidity gives rise to spasm of the pylorus or aperture of exit. As a general rule there is perfect comfort for about an hour after the meal, then the characteristic symptoms begin, viz., discomfort, heartburn, nausea, giddiness, and palpitation or a sense of oppression, which are only relieved by the eructation of gas, drinking some fluid which dilutes the acid gastric juice, or the consumption of another meal.

The dietetic treatment of such cases varies. Where the acidity has been called forth by the regular consumption of an excess of meat, fish, fowl, etc., the excessive secretion is a means to an end. But hyperacidity also occurs in people who eat little meat, and, therefore, the proportion of acid is only relatively high, that is to say, the acid is secreted but it has not got the right kind of food to work upon. In either case, the disorder is fostered by hurried eating, imperfect mastication, and wrong diet. Therefore the first thing to do is to regulate the habits as regards the kind and amount of food, care in its mastication, and regularity in the hours at which the meals are taken. These rules are applicable to all dyspeptics.

Authorities differ as to the kind of food such patients should be allowed. There is no doubt that a profuse secretion of gastric juice is provoked by an excess of meat, soups, meat extracts, and so forth; and fat has a retarding influence on the secretion, and especially on the amount of acid; while bread and other starchy foods provoke only a slight secretion of gastric juice. But the patient has to be considered individually. If the disorder occurs in one who has hitherto consumed little animal food, it would be better to reduce the amount of bread and other starchy foods to a minimum and increase the intake of meat, fish, milk and eggs as much as possible, to give the gastric secretion more substance to work upon. Of course, it will be necessary for these foods to be in an easily digestible form, and unaccompanied by vegetables, such as cabbage, turnips, swedes, and raw salads.

On the other hand, there are some cases where the animal food should be restricted. These are people who have been accustomed to eat a lot of meat, fish, and eggs. There is no doubt that these foods speedily absorb the gastric juice and prevent or diminish pain or irritation. But it is plain enough that if such foods continue to be taken in excess the supernormal secretion of gastric juice will be encouraged. Nature continues to respond to the demands made upon her for hydrochloric acid so long as she can do so. But the continued call for acid to combine

with the animal foods which are constantly taken may tend to hypertrophy of the glandular elements of the mucous membrane, and to their ultimate exhaustion and inability to respond (hypochlorhydria), whence the last state of the patient may be worse than the first. Therefore no general rule of treatment can be established. Each case must be treated on its merits, and each article of the diet must be selected by reference to the present condition or the former habits of the patient.

If the medical attendant decides to exclude all starch, sugar, and other forms of carbohydrate food from the diet, there are several courses open to him. He may prescribe the Salisbury diet, consisting solely of lean meat and hot water, for a period of six or eight weeks. This diet has proved exceedingly useful in men who have a decided tendency to gout. Where this dietary is not prescribed the food may still be of a protein character, and something like the following will answer the purpose :—

Breakfast.—Two boiled eggs, Protene biscuits,¹ and a cup of milk-tea.

10.30 A.M.—Boiled ham (mostly lean) 4 ounces, a slice of gluten bread, and a glassful of hot water.

Dinner.—Beef-steak 4 or 6 ounces, two tablespoonsful of mashed potatoes, and a wineglassful of burgundy or claret diluted with water.

Afternoon.—China tea with a tablespoonful of cream in each cup, and a Protene biscuit.

Supper.—Two scrambled eggs or 4 ounces of cold meat, and Protene biscuits.

10 P.M.—A tumblerful of hot milk.

The meals should be small and frequent; hot water should be taken between the meals or just before them, and the total allowance of gluten bread and Protene biscuit should not exceed 4 ounces.

If the patient is very bad an exclusive milk diet may be ordered for one month. In this case the patient should re-

¹ These biscuits are made from milk-powder by the Protene Company; they are similar to Plasmon biscuits, and they may be used alternately.

tire to bed, and be fed with a tumblerful of milk every $1\frac{1}{2}$ or 2 hours, making a total of 5 pints a day. But I have seldom found it necessary to resort to such extreme treatment.

On the other hand, I have found it advisable in some cases to reduce the amount of animal food for a time, and order a corresponding increase of fat and carbohydrates. In such a case the diet must consist of light and easily digested foods: milk, milk puddings, junket, custard, eggs, jelly, blancmange, arrowroot, bread, and an abundance of butter, boiled fat bacon or ham. After a time the diet may be improved by the addition of tender meat, poultry, and steamed fish, such as sole, plaice, or whiting. All kinds of sweet foods, soups, broth, strong tea, condiments, spices, and alcohol (except a glass of red wine, well diluted) should be forbidden until the recovery is complete.

It has been observed that the amount of acid in the gastric juice can be reduced by keeping salt out of the food; therefore salt should be avoided or reduced to a minimum. For a long time after the cure is complete the patient must continue to exercise great care over his food, keep the allowance of tobacco, and especially of alcohol, down to a minimum. The latter should consist of lager beer, a glassful of hock, claret, or burgundy, well diluted, or a small amount of whisky in a lot of water.

In the second form of acid dyspepsia the analysis of the gastric contents, while showing a very high degree of acidity, often shows that there is a deficiency of hydrochloric acid (*hypochlorhydria*), and the digestive power of this secretion is very weak. The acidity is due to the formation of organic acids.

One of the commonest causes of this condition is long-continued irregularity in the quality or quantity of the food or food accessories (spices, condiments, alcohol). Such a course leads first of all to hypersecretion—the stomach responds to the demand for a larger supply of gastric juice as long as it can. Nature always does respond freely and give abundantly when we ask more than usual from her; this generosity often leads to hyperchlorhydria (the condition

which was considered above). But the long-continued irritation leads to changes in the gastric glands, and Nature is no longer able to respond to our demands for gastric juice, because the instrument through which she replies, the gastric glands, are exhausted by overwork ; the quality of the secretion becomes poorer and less effective. This condition of hypochlorhydria may occur from irregular living and feeding, anaemia, chlorosis, catarrh of the stomach, infectious diseases, and chronic wasting diseases. In acute catarrh of the stomach the amount of gastric juice sinks to nothing, there not being sufficient to digest a small meal of ordinary food ; during convalescence the pepsin reappears before the acid. In typhoid and other fevers the hydrochloric acid sinks to a very small amount, while lactic acid and other acids rise in proportion. In anaemia the hydrochloric acid is deficient when the patient suffers from chronic indigestion ; in other cases there is an excess of hydrochloric acid. The most important cause of hypochlorhydria, however, is catarrh of the stomach ; as the amount of gastric juice diminishes other acids increase, so that the condition of organic acidity is almost sure to follow hypochlorhydria. Microbes grow in the stomach, as they do in all other cavities ; but hydrochloric acid is a disinfectant, and keeps them down. The stomachs of healthy people are almost free from microbes ; the gastric contents of thirty healthy persons revealed the presence of only three kinds of micro-organisms ; two were moulds and one a bacillus. But in persons who suffer from hypochlorhydria, as in catarrh of the stomach, dilatation, or cancer, various micro-organisms readily flourish and multiply abundantly, thereby causing acid fermentation, alcoholic fermentation, and putrefaction of the food.

In consequence of the deficiency of hydrochloric acid, the digestion of the food is delayed, and the undesirable micro-organisms have ample time to work their will upon all kinds of carbohydrates and produce therefrom butyric, lactic, and acetic acids, and various gases. These unpleasant changes cause a depreciation of the appetite ; the tongue becomes coated, flabby, and sometimes marked around its borders with an impression of the teeth. In spite of the poor

appetite, a sense of fullness follows the meal, with flatulence, nausea, occasionally vomiting, and either constipation or diarrhoea. Thus we find that meat, fish, milk, and eggs are badly digested, because of the deficiency of hydrochloric acid in the gastric juice; while sugar, bread, milk puddings, and other starchy foods are decomposed by bacteria and give rise to organic acids. The organic acids do not assist in the digestion of food; on the other hand, they irritate the stomach, hinder digestion, and weaken the motor-power of the organ, so that dilatation often follows a long course of organic acidity.

The dietetic treatment of such cases requires to be carefully considered. So long as the motor-power of the stomach remains good the patient may be allowed such animal foods as will readily and quickly pass through the pylorus into the bowels. Thus it is proper to give milk, eggs, meat reduced to a pulp, chicken panada, light steamed fish, milk puddings, custard, junket, jelly, and stale bread. It should not be forgotten that butter and other fats check the secretion of gastric juice, and should be reduced to a minimum; while soup, beef-tea, and meat extracts promote the secretion of gastric juice and are useful foods. The following dietary would be suitable for an average case:—

Breakfast.—Two eggs lightly boiled or poached; or 5 ounces of fish (sole, plaice, whiting, fresh haddock, brook trout, brill, bream, etc.); stale bread, "pulled" bread, or dry toast; a breakfastcupful of milk, cocoa, or weak tea.

Lunch.—A cupful of fairly strong soup or broth; chicken or mutton; potato, spinach, vegetable marrow, boiled lettuce, kidney beans; milk pudding, custard, junket, or jelly.

Dinner.—Soup; fish; chicken, pheasant, breast of turkey, rabbit, lean mutton, undercut of beef; potato purée, spinach, or other vegetables as for lunch; and the same kind of puddings, baked apples, or apple sauce. A few grapes, a slice of pineapple, a tangerine orange, one plum or apricot or a few strawberries may be allowed.

Alcohol.—A glass or two of claret or burgundy, or whisky and water.

"Pulled" bread is prepared by taking small pieces, about a dessert-spoonful each, from the inside of a new loaf and baking them in an oven until they are crisp and dry. Toast should be crisp, and eaten without butter. Apples are considered a tonic to a weak stomach; they do not suit everybody, even when baked or made into sauce they may irritate the mucous membrane; but they may be tried.

The food should be well salted, as salt is considered to increase the strength of the gastric juice. Spices and condiments have temporarily a good effect by promoting the motor activity of the stomach, causing the expulsion of gas and assisting the stomach to propel the food into the intestines. They are useful if taken in moderation by persons who have not previously abused them. The old rule, that we should treat the patient rather than the disease, here comes in again. Spices are well-known causes of indigestion; they have been enumerated among the substances which cause an excess of gastric juice and hydrochloric acid. But their continued use in large quantities causes congestion of the mucous membrane, hypertrophy, and ultimately atrophy of the gastric glands; so that primarily they cause a profuse and secondarily a scanty secretion. The deduction with regard to acid dyspepsia is this: if the patient has been accustomed to use a lot of pepper, mustard, horseradish, pickles, cayenne, and other heating substances, he must be forbidden to take them at all; if he has not been accustomed to take them, except in very small quantities now and then, he should be encouraged to use them more freely, in the hope that the stomach will be improved by the stimulation derived from them.

Similar remarks apply to soup, etc. A free secretion of gastric juice soon follows the consumption of soup, beef-tea, extract of meat, and its various preparations. Therefore such patients should take a cupful of one of these fluids at the beginning of lunch and dinner. A cupful of Bovril or Oxo would have the same effect as soup, and as they are more quickly prepared and sometimes better relished by patients, they may be used to the same extent as soup.

The attendant should be warned against allowing patients

of this class to take soup made from scraps of meat. If soup or broth is given at all it must be made from fresh meat or fowl. The danger of introducing the products of bacterial action on meat into the stomachs of such persons is obvious.

Vegetables have to be considered. Mashed potato, spinach, vegetable marrow, tender green peas, and other soft vegetables are permissible. But all coarse and fibrous vegetables, in their usual form, must be forbidden. Nevertheless, they are very useful for their salts and vegetable juices. But they should be taken in the form of French soup. This is made as follows: All kinds of vegetables are put into the pot along with some bones and scraps of fresh meat. Onions, turnips, carrots, celery, leeks, marjoram, a bit of thyme, mint, tarragon, or savory, some endive, chicory, and even cabbage may be added. These are boiled together for four or five hours, until the whole is reduced to a purée or consommé, and is then flavoured with salt, pepper, and other spices. It is now ready for use by ordinary persons; but for patients of the class we are considering it must be poured through a sieve to remove every particle of coarse fibre. It is not essential that any meat or bones be used in the preparation; but in that case the strained soup should be mixed with milk, one or two raw eggs, and put into a pan and stirred until it boils.

Sugar and sweets should be forbidden, on account of the fermentation and acidity which they cause. Therefore sweet puddings, cakes, jam, etc., are taboo. Acids are equally injurious; therefore sour fruit, pickles, and vinegar are forbidden. Salads are much too firm, and contain too much fibre to be digested by such a weak stomach.

These patients should take no fluid during the meal, except a cupful of soup or tea; they should not drink any more, lest they dilute the already weakened gastric juice; but they may drink freely two or three hours after the meal, when a cupful or two of hot tea, soup, or a glass of whisky and water would assist the final processes of gastric digestion.

But there are patients who will not improve with the most

careful dieting; in spite of all care the hydrochloric acid becomes more deficient, and the stomach weaker, until it is unable to propel its contents into the intestines in a reasonable time. In such cases the patient should be put to bed and given a milk diet for two or three weeks. Milk is the least irritating of all foods, and causes the least expenditure of energy during digestion. The amount given must not be very large at first; indeed, the patient may not be able to take more than two to two and a half pints a day at the beginning of the treatment, and the dose should not be more than a tumblerful every two hours. But the amount must be gradually increased until five or six pints a day are taken; the dose may then be a tumblerful every hour, or one pint every three hours. It may be raw if it is fresh from the cows, or boiled if it has been stored for some time; and it may be pure or diluted with barley-water, or flavoured with salt, celery salt, or extract of meat. The chief drawbacks to the diet are pain, flatulence, and diarrhoea or constipation. The pain is usually due to the formation of hard curds, which may be prevented by the judicious use of barley-water, or the addition of some extract of malt about ten minutes before it is consumed. Flatulence is due to fermentation, which may require the use of drugs. If ordinary milk is not tolerated after a few days' trial, we can resort to the sour-milk treatment, especially kefir or koumiss.

But ordinary milk or sour-milk diet is at the best only a temporary method of treatment. After two or three weeks some improvement of the diet must be begun. Thus: Breakfast, one pint of milk; lunch, one and a half pints of milk and two raw eggs; tea, one pint of milk; supper, one and a half pints of milk and two raw eggs. The duration of this diet must depend on the progress. Ultimately we must add soup, chicken panada, light fish, junket, jelly, custard, and thereby gradually build up a dietary similar to that given above.

CHAPTER X.

ATONY AND DILATATION OF THE STOMACH.

THE dyspepsia may end in a decided loss of tone and weakness of the muscular apparatus of the stomach. This is called atony, or motor insufficiency. The technical sign of the condition is the discovery that the stomach is unable to propel an ordinary meal into the bowels in the usual time. To definitely ascertain this fact, it is customary to give a test-meal in the middle of the day. It may consist of a plate of soup, five ounces of beef, two or three ounces of potato, a roll, and a glass of water. Under ordinary circumstances such a meal disappears from the stomach in five hours, leaving very few traces behind, and in seven hours at any rate the stomach would be quite empty. Therefore the amount of material which could be removed from the stomach five hours after the meal would be a measure of the loss of power or degree of atony of the stomach.

Atony of the stomach, or motor insufficiency, is one of the sequels of a long-continued indigestion, the causes of which have several times been enumerated. It should be stated, however, that there is a predisposition to this disorder in all persons who follow a sedentary occupation, who are subject to worry and the stress of business, to frequent losses of blood from any cause, prolonged discharges or the nursing of infants, anaemia, and other circumstances which interfere with the general nutrition. The condition often follows influenza, typhoid, rheumatic fever, and other febrile conditions. In most fevers there is a diminution of the ordinary activity of the stomach; the gastric juice is deficient, as

well as motor power; and, although the appetite may return, the stomach does not always as quickly regain the power of digesting the food; consequently the atonic condition persists and may lead to serious trouble. It will be perceived, therefore, that this form of dyspepsia is not so often the result of errors in the food as those previously discussed, but it comes as the result of some previous illness and other circumstances which interfere with the general health.

Excepting when it follows a serious illness, atony of the stomach comes on slowly. The victim becomes pale and thin, has a worried and anxious expression, a look of weariness or fatigue; moreover, a sensation of weariness in the limbs and a dull pain in the head are often complained of. The gastric symptoms are not markedly different from those previously described in other dyspepsias. There is a feeling of weight and discomfort in the stomach, with heart-burn, belching of wind, and rising of acid fluids. The acidity is caused by fermentation and bacterial decomposition. The products of decomposition of the food set up gastric catarrh, the gases originating therein distend the enfeebled organ and still further interfere with the motor functions, and lead to dilatation. When atony of the stomach has lasted for some time, the weakened organ nearly always becomes more or less dilated. The degree of dilatation is not very great at first, and, as the organ recovers tone and muscular power, the dilatation disappears. When dilatation occurs the pain and discomfort after eating are increased, food gradually accumulates in the stomach, and after a time the distension increases to such a degree that relief is only obtained by vomiting. In well-marked cases the vomiting occurs at intervals of two or three days, and the material brought up consists of the gastric secretion, semi-digested and fermented food, together with bacterial and fungoid organisms and their products. The influence of this dilatation and its interference with digestion is seen in the progressive emaciation of the body.

The diagnosis of dilatation, like that of failure of the motor power and gastric insufficiency, is made by drawing off the

contents of the stomach after a test-meal. Apart from this test, the dilated organ can be felt by palpation and percussion of the abdomen. The stomach often extends below the umbilicus; and a sensation of "splashing" can be obtained by palpation. Moreover, the peculiar vomiting and the great amount of material brought up are only present in this disease. The quantity of material often amounts to two or three pints, or sometimes quarts; and it comes out of the mouth as if it were pumped up.

Thus we may see dilatation of the stomach resulting from a well-marked gastric irritation, but the organ regains its size when the stomach is empty; or from atony of the stomach, where the dilatation may be slight and depend on the recovery of muscular power; whereas in chronic gastric catarrh there may be dilatation varying from a slight degree, which disappears when the stomach is empty, to a more severe and permanent dilatation. But these functional disorders of the stomach are not the only causes of dilatation. It may occur as the result of an obstruction to the passage of food through the pylorus. Thus, it may be due to an ulcer in the duodenum or in the region of the pylorus, to a cancer or other new growth in the stomach or some adjacent organ, to adhesions, or traction upon the pyloric end of the stomach. In the obstructive form the dilatation of the stomach is not necessarily preceded by atony or loss of muscular power; as a matter of fact, the muscles of the stomach are normal, and, in the first instance, dilatation is prevented by a development of the muscles (hypertrophy) to overcome the obstruction. But by and by the muscle fails, it can no longer drive the food past the obstruction so well as it formerly did, and the stomach becomes dilated in proportion to the degree of failure. Thus, in pyloric obstruction there may be hypertrophy of the stomach without dilatation, hypertrophy with dilatation, or dilatation without hypertrophy. The dilatation is due to a distending force, but the distension does no harm to the stomach so long as the muscle is able to recover from stretching—that is, so long as the nutrition of the muscle is good. But when the nutrition fails, the stretched muscle remains stretched, and thus we have a

secondary dilatation. In primary dilatation, due to atony or catarrh of the stomach, the muscle is already weak, and the resistance or elasticity which an ordinary muscle possesses is lost. In either case the distension is due to the delay of food in the stomach, to the deficiency of hydrochloric acid, the unchecked development of bacteria, and the fermentation and putrefaction which they cause. Thus arise the acids and gases which prolong the gastric irritation and catarrh, and intensify the dilatation by distending the stomach with gas.

Atony of the stomach, apart from dilatation, may be temporary or permanent. Atony which is the result of curable affections, such as infectious and other acute diseases, prolonged lactation, profuse discharges, haemorrhage, anaemia, chlorosis, overwork, worry, anxiety, and many other causes of indigestion, is curable. But that which occurs in Bright's disease, granular kidneys, amyloid disease, tuberculosis, malignant disease of various organs, and local affections in the stomach, such as prolonged gastric catarrh, atrophy of the mucous membrane, or cancer, is either incurable or only partially benefited by treatment.

Dilatation of the organ may also be of a temporary or permanent character. The slight degree of dilatation which occurs commonly in many cases of atony is curable. Still greater degrees of dilatation occurring as the result of duodenal or pyloric ulcer, and other forms of pyloric obstruction, may also be cured. But in those cases where the obstruction cannot be removed no cure can be expected.

THE TREATMENT.—The condition of general debility which underlies atony of the stomach must be attacked. This is the more important in all those cases which are not the direct result of the abuse of food and drink. Remedies which will improve the tone of the body, increase vital power, and stimulate the activity of the muscles, will also increase the motor activity of the stomach, and improve the quantity and quality of the gastric juice. The indications for treatment are (1) to remove the cause of the disease; (2) promote general nutrition by proper exercise of the mind and body; (3) and render easy the process of digestion by proper selection and preparation of food.

The food is exceedingly important. The amount consumed must be within the power of the stomach to deal with it. Sufficient time must be given for the weakened organ to do its work. The selection and preparation of the food must be suited to the condition of the organ. But it is useless to pamper the appetite or yield to the cravings of the stomach. In mild cases of atony, modified ordinary diet, such as that previously detailed for chronic gastric catarrh, may be given. In more severe cases a mixed milk and ordinary diet would be useful. In either case too much starch or sugar must be avoided; the food must not be too concentrated, and it must always be well and carefully cooked. As the general condition improves, the amount and quality of the food may be improved. Any article which disagrees by occupying a long time in digestion, causing much pain or considerable flatulence, must be removed from the diet.

In chronic cases the change of food had better be brought about gradually rather than suddenly. A sudden cessation from all the agreeable articles of food is not likely to be permanent. Therefore, while cutting off at once well-known indigestible articles, such as pickles, pork, and pastry, it is better to gradually reduce the food until a suitable permanent diet has been reached. The object of treatment is best attained by means of a spare diet, consisting chiefly of animal foods and the restriction of fluids. The avoidance of bulky meals, consumption of food without drinking, and careful mastication assure the material being swallowed in a state of fine subdivision and that the stomach is not overloaded. If the appetite fails, abstinence (within reason, of course) is better than pampering the stomach with dainty fare or stimulating it with wine or spirits. When the appetite is good the patient should cease eating before the feeling of satisfaction is reached, for it is better to eat too little than too much. The meals should be only three, and they should be six hours apart. A moderate use of salt, pepper, mustard, horse-radish, and other aromatic condiments is commendable. An average patient might have a dietary similar to the following:—

Breakfast.—A cup of coffee or tea with milk or cream, but very little sugar. One or two eggs, boiled or poached, and some fish of the lighter kinds must form the principal part of the meal. A few slices of stale bread, very dry toast, or "pulled" bread may be eaten.

Dinner.—No meat or fish at this meal. It may consist of macaroni and tomatoes, boiled rice with gravy or extract of meat, spinach, vegetable marrow, tender green peas, kidney beans, mashed potato and cream, and either cabbage, savoy, or carrots in the form of purée, milk pudding, apple sauce, or a few stewed plums. At the end of the meal one-quarter pint of pure water, or a glass of claret or burgundy.

Supper.—Clear soup, about three ounces, any kind of light fish, tender lean beef or mutton, rabbit, poultry, pheasant or partridge, one tablespoonful of mashed potato or boiled rice, or a slice of dry toast or "pulled" bread. No pudding or sweets. At the end of the meal a small glass of water alone or with a tablespoonful of whisky, or two glasses of claret or burgundy.

Thus the patient will have two meals consisting chiefly of animal food and one of vegetables; the meals are small; eaten dry they will be well masticated, and being six hours apart will not over-tax the stomach.

In simple atonic dilatation the indications are similar—namely, to improve the tone of the stomach, to avoid distension as much as possible, to promote the propulsion of the food into the bowels, and discourage any tendency to fermentation. These indications are met by a dietary such as the foregoing. That is to say, the food should be of small bulk and eaten dry, the total amount of liquids should not exceed one and a half to two pints, and may advantageously be reduced to one pint for two or three weeks. As the sufferer may have been a big drinker previous to the treatment, this limitation of liquids is often rather difficult to enforce; but it is a necessity for successful treatment. The distension of the stomach is also avoided by forbidding the consumption of fresh salads or raw fruit and heavy vegetables such as cabbage, savoy,

turnips, swedes, and carrots, except a small amount in the form of purée. The avoidance of much bread and potato, of all sweet cakes, pikelets, crumpets, muffins, etc., of excess of milk puddings, custard, or junket tends to reduce the fermentation. The avoidance of fat meat, pork, bacon, ham, duck, goose, mackerel, herring, salmon, eel, halibut, lamprey, alewife, and other greasy foods is beneficial. All dried and seedy fruits must be avoided, such as currants, raisins, figs, candied fruit or peel, strawberries, raspberries, and gooseberries, partly because of the seeds and skins, and partly because of the acids in them. All acid substances ought to be avoided.

There are some cases of atonic dilatation more difficult to treat. These especially follow severe illness, neurasthenia, prolonged mental exhaustion, worry, and anxiety. The treatment of these cases must be somewhat different. They should be confined to bed, and given a diet which contains very little carbohydrates. The patient should be fed every two hours with a small meal. The food should consist of one to one and a half pints of milk enriched with plasmon or sanatogen in four doses four hours apart. At the intermediate meal he should have raw eggs, scraped beef, beef-juice, pounded chicken or fish, with a small thin strip of dry toast or a bit of pulled bread. The total quantity of food must be small, and not more than a bare sufficiency for a person at rest. After ten or fourteen days of such feeding the patient may be allowed to sit in a chair for an hour or two at a time, and the food may be improved, but each meal should be followed by rest in bed. The diet may now consist of something like the following:—

Breakfast.—Two eggs or five or six ounces of light fish and two ounces of dry toast or pulled bread; a cupful of tea or cocoa made with milk at the end of the meal.

Lunch (11 a.m.).—A glass of milk, with a sandwich of tongue or pounded chicken.

Dinner (2 p.m.).—Oysters (four or six) or fish, followed by two or three ounces of scraped meat, pounded chicken, tongue, or tripe; a tablespoonful of mashed potato, and a slice of dry toast; followed by a tablespoonful or two of

junket, custard, milk jelly, or ordinary jelly and cream; a glass of milk to drink or a glass of red wine.

Tea.—A cupful of China tea and a plain biscuit or dry toast.

Supper (7 p.m.).—Similar to dinner.

Bedtime.—Milk and sanatogen or plasmon.

In obstructive dilatation other factors come into the problem. In primary atonic dilatation the motor power is absolutely defective, and the idea is to give foods of such a character that they can be quickly passed on to the intestine, where their digestion will almost entirely be performed. In secondary or obstructive dilatation the motor power is at first only relatively defective, there is an obstruction to the passage of foods into the bowels, and the main idea is to give foods which will be digested in the stomach and absorbed through its mucous membrane. It is absolutely useless in such a case to fill the stomach with bread and potatoes, oatmeal, milk puddings, rusks, biscuits, or vegetable purées; they cannot be digested in the stomach and their passage into the bowels is hindered. Moreover, their presence encourages fermentation, with its attendant heart-burn, acidity, belching, regurgitation or vomiting. All foods of this class must be entirely removed from the dietary. Milk is still one of the best foods; but it must not be given alone, because of the tendency to form hard curds. It should be combined with citrate of soda, extract of malt, or it may be peptonized. Thus the formation of large curds will be prevented. Moreover, the addition of a tablespoonful of extract of malt or half an ounce of milk-sugar to cow's milk increases the proportion of soluble nutriment which may be absorbed. Extract of malt contains maltose which is less liable to fermentation than lactose. In addition to milk we can give raw eggs, scrambled eggs, egg custard, scraped or minced meat, potted tongue, pounded chicken, soft or light fish, oysters, meat-powders, meat-extracts, plasmon, sanatogen, protene, eucasein, and somatose. The total daily amount should include three pints of milk, two eggs, ten and a half ounces of meat, fish, chicken, etc., and one or two ounces of extract of malt. The proper plan is

to reduce all food to a pulp by a fine mincer, to remove stringy or fibrous portions, and pass all through a sieve.

If the obstruction increases, it is possible that no food but peptonized milk and similar articles will be retained. We must then confine our attempts at feeding to the administration of peptonized and pancreatized milk, Mosquera's beef meal, meatox (beef powder), beef-plasmon, Carnrick's peptonoids, Brand's beef peptone, panapeptone, Kemmerich's peptone, Armour's soluble beef, hipi (mutton essence), Darby's fluid meat, etc. The predigestion of carbohydrates is unnecessary if the right kinds are used—namely, extract of malt, milk-sugar, and golden syrup, which will be propelled easily through the pylorus if anything can go. But all dietaries may be useless in bad cases, and nutrient enemata have to be resorted to until the operation of gastro-enterostomy is performed to make a new opening between the stomach and bowels.

Other points in treatment of all cases are important. The patient should rest after every meal, and lie on the right side to facilitate the passage of food into the bowels. The patient should wear a flannel belt with a pad over the umbilicus. Massage is valuable, especially skilled massage of the abdomen at a proper interval after meals. General massage of the body and all tonic and recuperative measures are useful. Gastric lavage or washing the stomach out will restore tone to the stomach, remove fermented materials and micro-organisms, and cleanse the mucous surface. It should be done once a day with an alkaline water (bicarbonate of soda or magnesia), a solution of tannin, or proper Spa waters. After each lavage a dose of olive oil would tend to remove pain and irritation. Exercise in the open air, on foot or horseback, golf or tennis, is beneficial to those able to take it. Indolence and a sedentary occupation should be avoided. Change of air to a bracing climate is very good for all cases. Encourage the patient, avoid depressing tales and circumstances.

CHAPTER XI.

CANCER OF THE STOMACH.

CANCER may affect the entrance, the exit, or any intermediate part of the stomach, but it more often affects one of the openings than elsewhere. Cancer of the stomach is essentially a disease of the latter half of life, and more often affects men than women. We will first consider cancer at the entrance of the stomach.

I. *Cancer of the Oesophagus.*—The entrance to the stomach consists of the gullet or oesophagus. It may be affected by cancer in any part of its course, but the disease is far more common at the opening into the stomach than any other part of the tube. The symptoms of the disease are few. The first indication of anything wrong is a difficulty in swallowing, due to the food “sticking” in some part of the passage or meeting with some obstruction. This symptom is at first not very pronounced, and it may occur only occasionally as the result of a spasm produced by irritation of the diseased part. After a time, however, a stricture is formed, the difficulty becomes more obvious, and it is seen that the food will not go down without difficulty. By and by a dilatation occurs above the seat of stricture, a pouch is formed in which food collects, and some of the food is regurgitated. An examination with an oesophageal tube shows the existence of an obstruction, and pain is caused by the passage of the tube through the stricture. When the cancer ulcerates, blood, mucus, and sometimes pus are brought up with the regurgitated food. On testing the reaction of the latter with litmus paper it is found to be alkaline, whereas food brought up from the stomach is usually

acid. As the disease progresses there is a more or less constant pain which increases with the growth of the cancer and implication of nerves and surrounding structures. The patient emaciates and his abdomen becomes flat. The prognosis is very bad and the duration of the disease uncertain.

The treatment of such a case will tax the ability of the nurse and her skill in the use of the stomach tube. So long as the patient can swallow soft and liquid foods he may have three or four pints of milk and raw eggs, strong soup, potted or pounded meat, fish, or fowl, purée of potatoes and other vegetables, fine oatmeal, arrowroot, and other farinaceous foods, such as Allenburys', Savory and Moore's, and Benger's or Mellin's, and plenty of sugar, glucose syrup, or other nourishing liquids or semi-liquids. Butter can be freely mixed in many of these foods. Cream and cod-liver oil are useful forms of fat.

When the patient can no longer swallow such foods he must be fed three times a day by means of a stomach tube. The nurse must give a good meal while she is about it. It may consist of $1\frac{1}{2}$ pints of milk, three or four raw eggs, or 6 or 7 ounces of pounded meat, and one of the farinaceous foods, and a little water or other liquid at the end of the meal. When it becomes absolutely impossible to pass the stomach tube she must resort to rectal feeding. After resting from the use of the stomach tube for a few days it occasionally happens that the stricture relaxes and the tube will again pass readily. The patient should then be fed as before. But when the disease is sufficiently advanced to render the use of a stomach tube necessary the question of an operation to make the feeding more easy should be considered by the patient and his friends. The operation consists in the formation of an aperture into the stomach through the anterior abdominal wall (*gastrostomy*). This operation will save the patient much pain, render the introduction of a tube quite easy, feeding can then be abundant, and the life of the patient will be prolonged.

II. *Cancer of the Stomach*, like that of the oesophagus, seldom affects anyone under fifty years of age. Little is

known about the antecedents of such a case, but there are reasons for suspecting the pre-existence of an ulcer in a large proportion of the cases. The symptoms which attend the disease are not characteristic of cancer. They are those of a bad dyspepsia—viz., pain after food, vomiting, regurgitation of sour or fermented food, and tenderness of the stomach. The most important symptom is progressive loss of flesh ; this always occurs, and may be very rapid. If pain after food is combined with rapid loss of flesh and the vomiting of blood or “coffee grounds,” there are serious reasons for believing the trouble is due to cancer. If to these symptoms is added a peculiar tint of the skin, a dirty yellow, earthy, or fawn colour, and especially if enlarged glands can be felt under the skin of the abdomen, groin, or axilla, or a growth is perceived in the stomach, the diagnosis of cancer is pretty certain.

If it is known that the cancer does not affect the outlet or pylorus, that is to say, there is no obstruction to the passage of food, the patient may have free choice of food, because it is probable that the duration of life will not be very great. Nevertheless, it is advisable to guide the patient's choice in the direction of digestible foods. Moreover, there is one feature of the case which suggests a limitation of certain foods ; this feature is the well-known deficiency of hydrochloric acid in the gastric juice of all cases of cancer, and the probable development of organic acidity due to fermentation. The correct and scientific diet for such persons, therefore, is that previously detailed for cases of organic acidity and hypochlorhydria.

If, however, the pylorus is affected, and the exit of food is hindered, the diet should contain an excess of animal foods and very little starchy material. In such a case we should forbid the consumption of bread, biscuits, oatmeal, farinaceous foods, potatoes and vegetables, and even milk puddings, because they cannot be thoroughly digested in the stomach and their outward passage is hindered. Their consumption would lead to fermentation, flatulence, acidity, vomiting and dilatation of the stomach. The occurrence of dilatation would probably cause the stomach to become prominent,

and thus distinguish cancer of the pylorus from that of the oesophagus. The food, therefore, must consist of substances which will be digested and absorbed in the stomach. The basis of the diet should be milk, and a saltspoonful of citrate of soda could be added to each pint to prevent the formation of curds. We may also give raw eggs, meat-powders (Meatox, Mosquera's beefmeal), Plasmon, or other milk-powders, somatose, junket, custard and jelly. Extracts of meat are useful by promoting a flow of gastric juice, and a little strong soup may be given now and then for the same purpose. It is seldom, however, that the pylorus is absolutely closed ; liquids and liquefied foods will pass through it. Therefore Mellin's food, whey and other liquids containing sugar, extract of malt, or dextrin, may be given. Possibly some arrowroot combined with Taka-diastase to digest it would pass through ; it can be tried, and if it is successful in passing through may be given every day. The fat of milk is extremely fine and will usually pass the pylorus. Sugar of milk, golden syrup, extract of malt, will also go through. Jelly would be liquefied in the stomach and pass as easily as other liquids. Vegetables can be boiled, and a few ounces of the liquid containing some of the substance rubbed through a sieve can be tried. A considerable amount of time and care must be spent in the preparation of animal food. A fine mincing machine is better for this purpose than anything else ; but cooked meat or fowl can be reduced to a pulp with a pestle and mortar. If the latter method were adopted considerable assistance would be derived from cutting the meat or fowl into very thin slices before pounding it. When it is reduced to a paste, the addition of some cream, butter, or strong soup would render it palatable ; pepper and salt can be added. Various commercial pastes of meat, fowl, or fish would be useful.

When the obstruction of the pylorus is very great the stomach loses its power of absorption to some extent, the secretion of hydrochloric acid is correspondingly diminished, and digestion is thereby weakened. We must now rest our hopes on predigested foods, peptonized milk, Leube's soluble meat, somatose, panopepton, Carnick's peptonoids,

Bovinine, Darby's fluid meat, Valentine's meat juice, Brand's essence of beef, and other preparations which require no digestive effort. If haemorrhage occurs, the patient should be fed by the rectum for a few days until all bleeding ceases. The rest obtained by the stomach may lead to a relaxation of the stricture, and when stomach-feeding is again begun foods previously found impassable now pass through easily.

In such cases the operation of gastro-enterostomy, by forming a new aperture between the stomach and duodenum, may afford considerable relief. This operation will make the patient more comfortable, feeding will become an easy matter, and his life will be prolonged. These advantages show the desirability of such an operation being performed as soon as a well-marked obstruction of the pylorus is discovered; and the tendency of the present day is to secure every advantage which can be obtained in this manner.

CHAPTER XII.

ULCER OF THE STOMACH AND DUODENUM.

WHY does not the stomach digest itself? This question has been asked for centuries, many theories have been propounded to explain it, and still the puzzle remains. If an artificial gastric juice be prepared we know that it will digest meat, fish, and eggs or similar substances ; these, however, are dead materials. If a living animal or a limb of such an animal be kept in an artificial gastric juice it will not be digested, except so far as the dead cuticle is concerned. But if the tissues of such an animal's limb be injured, there is no guarantee that they will not be digested ; if the injury is sufficient to interfere with the nutrition of the skin and muscles they will certainly be digested. Living animals have been known to exist in the human stomach ; thus the ordinary round worm, frogs, toads, and newts in their fully-developed condition, have been ejected by vomiting. Therefore it appears that the healthy living tissues contain some protective material which the injured tissues do not contain. It is argued that the living stomach also contains some protective material which, under ordinary circumstances, prevents the gastric juice from digesting it. It has been suggested that this protection is due to an antiferment secreted by the cells of the stomach ; it has also been held that a free secretion of mucus forms a protecting varnish to the mucous membrane ; and that the blood flowing constantly through its vessels is alkaline, while the gastric juice is acid, and one counteracts the other. Some of these theories are valueless. It is probably a sufficient protection that the tissues are living, like those of animals occasionally incarcerated within the stomach. If the nutrition of the cells of

the stomach is low, or their vitality reduced by a deficient nerve supply or deficient circulation, neither the coating of mucus nor the alkalinity of the blood will protect the stomach entirely. A reduction of vitality in the cells of a small area may occur from many causes, and if they have not sufficient power to resist the poisonous effect of the small amount of hydrochloric acid, the cells would then be destroyed and digested by the gastric juice. Thus a sore place or ulcer is formed. Once started, such an ulcer, perhaps originally very minute, spreads by a continuance of the same circumstances. The reduction of vitality may be due to a deficiency of some normal ferment in the cells of that small area or to the formation of a particular toxin in them. Observations have shown that an ulcer can easily be produced by using a particular serum, which reduces the vitality of the cells—when the gastric juice contains a normal or supernormal amount of hydrochloric acid; if the proportion of acid is greater than usual the ulcer will be more extensive than when the gastric juice contains only the normal quantity of acid. In most cases of ulcer of the stomach the gastric juice is very acid (hyperchlorhydria); and whenever the vitality of the mucous membrane is reduced by a toxic substance the cells are liable to be attacked and digested by the gastric juice. That is the theory recently promulgated. But there are other feasible explanations. If a tiny focus of inflammation occurs in an enfeebled spot, as the result of septic infection or mechanical injury, an embolism may occur in a small blood-vessel and cause a tiny patch of necrosis. It is well known that acute gastric ulcers commonly occur in the course of ulcerative endocarditis and other infectious diseases where small emboli form in the gastric arteries. There may be no evidence of a severe septic disease preceding an ordinary gastric ulcer; but there is abundant evidence of septic matter from the teeth and gums and of bacteria from the food finding their way into the stomach. There is also plenty of evidence that the food may contain hard particles of substances which by their mechanical action may cause local inflammation and predispose the tissues to embolism. It matters not, however, whether the death of the small piece of

mucous membrane is due to septic embolism, mechanical irritation, or the absence of some normal antibody, there is the fact that a small piece of dead or diseased mucous membrane forms a slough and falls out or is digested, and an ulcer is left. An acute ulcer has a clean and punched-out appearance. There may be one or several, but it is strange that in men the primary ulcer is in the duodenum, and in women it is in the stomach. We are quite ignorant of the cause of this peculiarity or why one person should be subject to an ulcer and not another. Gastric is far more common than duodenal ulcer, for out of 1300 cases 90 per cent affected the stomach, and only 10 per cent the duodenum. The ulcers are curable by rest and careful feeding, but relapses are common. They may also be cured by surgical means; but it would be an error to suppose such means are a prevention against other ulcers, for it has been shown that relapses occur in 10 per cent of the cases operated on. When a first attack of ulcer occurs medical treatment should always be resorted to. Indeed, I should strongly recommend medical treatment to be tried first in every case. But when the disease is very chronic, haemorrhage occurring frequently, and no cure resulting from medicine and food, recourse must be had to surgery, and we should be thankful that such means exist for the removal of the ulcer.

The persons most likely to be affected by gastric ulcer are young women. They are usually anaemic as the result of conditions which predispose to the ulcer. What those conditions are have not been finally settled. Sir Andrew Clark considered one of the chief elements was constipation; but many more girls suffer from constipation than from ulcer, and no clear connexion can be traced between them. Similar remarks apply to tight lacing, to which ulcers are sometimes attributed; but few men wear stays, and the occurrence of an ulcer in them is probably a coincidence. A sluggish circulation has been blamed for their occurrence, but we see perforating ulcers of the feet in people with a good circulation. It is probable that there is a special diathesis or constitutional state which predisposes to the formation of ulcers.

The chief symptoms of a chronic gastric ulcer are pain, vomiting after food, and haemorrhage. The pain begins soon after eating and lasts as long as there is food in the stomach. The painful area may be a spot small enough to be covered by a sixpence, or it may be more diffused and radiate to the shoulder-blades. Vomiting relieves the pain, and is seldom absent in a well-marked case ; it is exhausting by itself, and causes loss of strength and emaciation by removing much-needed food from the body. The vomited materials are more or less changed according to the length of time they have been in the stomach. They are often mixed with mucus, and contain an excess of hydrochloric acid ; but in bad cases there is a persistent catarrh of the stomach, profuse secretion of mucus, a deficiency of hydrochloric acid, and an excess of organic acids. But pain and vomiting may be absent. In such cases the ulcer is only diagnosed when it penetrates a blood-vessel and causes haemorrhage ; the bleeding may then be profuse and alarming. In cases where vomiting is constant there may be a slight oozing of blood from the granulated surface of the ulcer ; but this may be sufficient to make the diagnosis of ulcer more accurate than when there is only pain and vomiting. A duodenal ulcer causes discomfort after food and the peculiar "hunger pain" which is characteristic of the disease ; there may or may not be vomiting of food and blood, but more often there are mere traces of blood in the motions.

Although pain, vomiting, and bleeding from the stomach are the recognized indications of an ulcer, it cannot be denied that these symptoms may occur without an ulcer. Many patients have been operated on after profuse haemorrhage, and no ulcer could be found ; other persons have died after profuse gastric haemorrhage, and no ulcer could be found at the post-mortem examination, nor any evidence that an ulcer had ever existed. Some of these people may have had the characteristic pain, vomiting, and bleeding for years, and the most that could be found was a patch of congested mucous membrane. The condition is called Gastrostaxis or Gastrorhexis.

THE TREATMENT OF GASTRIC AND DUODENAL ULCERS.—In no class of cases is more benefit derived from the "rest cure" than in ulcers of the stomach. But the treatment should be carried out with thoroughness. Less than that is useless in any case coming under treatment. The idea is to produce physiological rest, that is absolute rest of the mind and body, including the stomach. By putting the patient to bed the expenditure of the body can be reduced to about 1400 calories of energy per day, which is considered the minimum. The feeding should be begun by giving 2 ounces of milk every two hours; this will be 24 ounces in twenty-four hours, and will yield 500 calories, or one-third of the energy used by the body; the remainder will be obtained by oxidation of the patient's tissues. If pain and vomiting follow these small doses of milk it may be diluted with an equal quantity of barley-water, lime-water, or other alkaline water to prevent the formation of curds. But the bulk of the meal is thereby increased. If the stomach resents this, we must resort to other means of preventing the formation of curds—viz., peptonization of the milk or the addition of 2 or 3 grains of citrate of soda to each ounce. In a mild case the patient will do very well with such treatment. On the second or third day the amount can be increased to 3 ounces of milk every two hours, making a total of 36 ounces; and each day the dose may be increased by 1 ounce, until a tea-cupful of milk is taken every two hours, making a total of 4 pints a day. Now, 1 pint of milk will yield 410 calories and 4 pints about 1600, which is enough to supply the energy used up and a little over to prevent the loss of flesh. If the patient cannot get through 4 pints a day we must resort to various ways of strengthening the milk. The first method is the addition of a milk-powder (Sanatogen or Plasmon); if these agree the total milk can be reduced to 3 pints on the condition that it is fortified by such powders. If they do not agree we can add some ordinary sugar, milk-sugar, and extract of malt, or Mellin's food to the milk for the same purpose. We can also add some Benger's food to one or two meals a day, or some peptonized milk gruel. If all seems to be going on well we can add a few other things to the list, so that

by the end of a week the patient is getting : milk (3 pints), Benger's food, Sanatogen or Plasmon, 2 raw eggs, some jelly, junket, baked custard, Brand's essence, beef Plasmon, and a tablespoonful of raw meat juice in an equal quantity of port wine twice daily. It should be remembered that the gastric juice contains too much hydrochloric acid in most cases of gastric ulcer, therefore all kinds of extract of meat should be avoided, because they would exaggerate the hyperacidity. But if the physician knows there is no hyperacidity, or that the gastric juice is deficient in the normal acid, it would be proper to give some extract of meat (Bovril, Lemco, Oxo) in the milk two or three times a day. These are ideal diets for such cases. But it is not always possible to maintain the standard at this high level. We must, however, do our best, and never lose sight of the fact that when the patient is not getting enough food to supply the energy used by the body, the tissues are used as fuel to provide such energy. After two or three weeks' treatment in this manner we must begin to increase the quality, quantity, and solidity of the food. The amount of milk should remain the same, but more Benger's food may be given alternately with Mellin's food or dextrinized cereal foods, such as Ridge's, Neave's, Savory and Moore's. Junket is a very useful food at this stage. If these disagree we can try peptonized milk gruel, boiled arrow-root, or fine oatmeal, cooked for four or five hours. The following recipes will be useful :—

(a) Take $\frac{1}{2}$ pint of milk, 1 egg, a dessertspoonful of Mellin's food, a pinch of salt, and a tablespoonful of sugar. Boil the milk ; beat up the egg, and pour the milk slowly over it, stirring all the time ; return to the fire ; when nearly ready add the salt, sugar, and the Mellin's food, dissolved in a very little water, stir until it begins to thicken, and pour it into a mould. It may be eaten warm or cold.

(b) Take a tablespoonful of Savory and Moore's best food and cook it in the usual way with $\frac{1}{2}$ pint of milk. While hot add $\frac{1}{4}$ ounce of gelatine, sweeten to taste, add a little flavouring, pour it into a mould, and turn out when it is cool.

If these foods agree we can next try a spoonful or two of scraped meat, pounded chicken or fish, and an equal amount

of mashed potato. At the end of a month the patient should be able to take a poached egg and stale bread and butter for breakfast; sole, plaice, or whiting for dinner; and sponge or Madeira cake for tea; a cupful of tea is also permissible. A gradual return to the ordinary diet should be made from this time forth, and the progress should be rapid.

In cases considered to be severe by reason of great haemorrhage, persistent vomiting, or some other indication of a more serious condition, it is advisable to stop all feeding by the mouth for the space of a week. Nothing should be swallowed. Rectal feeding should be resorted to. As rectal feeding is adopted in other cases besides ulcer of the stomach, a special article will be devoted to it. In these cases the patient should be given a "feed" of 5 or 6 ounces every four or six hours. We must not blind ourselves to the small amount of nutriment obtained in this manner. Six feeds a day, including a total of $1\frac{1}{4}$ pints of milk, 3 raw eggs, 1 ounce of extract of malt or glucose, and a little brandy, would only yield about 700 calories, or less than half the amount of energy spent by the body when absolutely at rest. But even this would not be all absorbed. Anybody who has treated patients in this way must have observed the large proportion of faeces which is returned. Moreover, the great deficiency of the food is evident by the rapid wasting of the body during such feeding.

In this period nothing should be swallowed. Some physicians allow their patients to take little bits of ice, iced water, Vichy, and other alkaline waters. One eminent physician says the patient may have a teaspoonful of water every fifteen minutes, making a total of 15 ounces in twenty-four hours, on the supposition that the amount is too small to irritate the ulcer. But even this small amount is likely to excite gastric secretion and peristaltic contractions. Therefore the rule should be absolute: Nothing by the mouth. Thirst will be very marked, of course; indeed, the patient may consider the treatment rather cruel. We must moderate the thirst as well as we can. It will frequently be checked by allowing the patient to wash out her mouth at intervals with boracic lotion, or any simple mouth-wash. The daily

washing out of the bowels may be followed by the injection of $\frac{1}{2}$ to 1 pint of warm water, which can be retained; indeed, many authorities consider reduction of thirst to be the chief advantage derived from rectal feeding. Some water is manufactured in the body by the oxidation of the tissues; under ordinary circumstances from 10 to 15 ounces are produced in this way, and it is considered when the body is living on its own flesh a good deal more water is produced, and, being retained, assists in the reduction of thirst.

How long should we refrain from mouth feeding? When the stomach has had five or six days of absolute rest, sufficient time has been allowed for any ruptured vessel to get sealed up. We may now try a test-meal of a few teaspoonsful of peptonized milk. If this small quantity causes pain, we must desist from a further attempt at feeding for a few days longer; in some cases it is unsafe to allow anything by the mouth for two weeks. But the patient will persistently lose flesh by using her own tissues in place of food; if the condition was fairly good at the beginning of the treatment this loss will soon be made up when a moderate diet is taken.

If the test-meal did not cause pain or vomiting we can give the same diet as in a mild case of ulcer, beginning precisely in the same way, viz., by allowing 2 ounces of peptonized milk every two hours, and gradually build up a diet on the lines previously indicated. In this kind of case, raw beef juice should be allowed early, say, on the third day of mouth feeding. Raw eggs, a spoonful or two of jelly, and Benger's food may be given by the end of the week. Rectal feeding should now be reduced to two meals a day, and kept up to the fifteenth day. In the third week the meals by mouth should include two or three pints of milk and two or three raw or poached eggs daily, Benger's food twice a day, scraped meat, pounded chicken or fish, a spoonful of mashed potato, some Madeira or sponge cake, stale bread (without crust), and plenty of butter, apple-sauce, sago or tapioca pudding, orange juice, and a few grapes free from skin and seeds.

The foregoing treatment is the safest and surest way to a

permanent cure, and it should be carried out whenever possible, the patient being confined to bed the whole time. But some physicians have of late years allowed a more generous diet. The most important modification is that of Lenhartz, who allows a large number of raw eggs, raw scraped meat or ham. The following is an outline of his dietary:—

First day.—Seven ounces of milk and 2 raw eggs in tea-spoonful doses.

Second day.—Ten ounces of milk and 3 raw eggs.

Third day.—Fifteen ounces of milk, 4 raw eggs, and a tablespoonful of sugar.

Sixth day.—The quantities of food are increased until on the sixth day the patient consumes 1½ pints of milk, 7 beaten raw eggs, and two tablespoonsful of sugar.

Seventh day.—Two ounces of scraped meat and 3½ ounces of rice milk are added.

Ninth day.—The diet is 1¾ pints of milk, 8 raw eggs, 1½ ounces of sugar, 2 ounces of raw meat, 7 ounces of rice milk, and 2 pieces of Zwiebach.

Eleventh to fourteenth days.—Milk, 1¾ pints; 8 raw eggs; sugar, 1½ ounces; raw scraped meat, 2 ounces; raw ham, 2 ounces; rice milk, ½ pint; Zwiebach, 3 pieces; butter, 2 ounces. The total food now yields 3000 calories. Zwiebach is a kind of pulled bread. In the third week the patient is put on ordinary mixed diet, but she is kept in bed until the fifth week, when she is allowed up for an hour or two each day.

Another generous diet is that of Hort, who uses a serum in the treatment of ulcers, and says the proper method of cure is to obtain the highest state of nutrition in the body as quickly as possible. In cases which do not bleed he prescribes the following food:—

Breakfast.—Toast, butter, and eggs; 11 A.M., 2 or 3 ounces of raw meat juice.

Lunch.—Tender beef, mutton or lamb, lightly cooked and served in the gravy; and one or two rusks. The appetite is the only check on the amount consumed.

Tea and Dinner.—The same food as for breakfast and lunch.

Bedtime.—Two or 3 ounces of raw meat juice. In the night one or two sandwiches of pounded chicken or game.

This diet is continued for one month; the food is eaten dry; but the patient is allowed a tumblerful of hot water at 7 and 11 A.M. and 10 P.M. After returning to full diet, the use of alcohol, tea, coffee, and starchy puddings are forbidden for six months.

In cases marked by haemorrhage, Hort prescribes the following:—

First day.—Feed every three hours with 2 or 3 teaspoonsful of chicken jelly and half the yolk of a soft-boiled egg alternately.

Second day.—Give 3 or 4 teaspoonsful of pounded chicken alternately with raw meat juice and the yolk of a soft-boiled egg, every two or three hours, day and night.

Third day.—The same diet in larger quantities.

Fourth day.—The dietary for non-bleeding cases is begun.

But such diets as Lenhartz's and Hort's do not meet with universal approval, nor have they the support of scientific observation. Indeed, some observations by Bolton tend to show that they are injurious. It was mentioned early in this account of ulcers of the stomach and duodenum that an ulcer could be produced experimentally by using a gastro-toxic serum obtained from an animal. When such a serum is administered to cats, and they are afterwards fed with meat, a slough forms and separates in four days, leaving a clean ulcer behind it. But if the cats are fed on milk a period of ten or eleven days elapses before the separation of the slough and formation of an ulcer. This is due to the influence of the food. Bolton found that the food had precisely the same influence on the healing process; in milk-fed cats the ulcer was completely healed in twenty days; in the meat-fed cats a large area in the centre of the ulcer still remained unhealed. Meat encouraged the formation of an ulcer and delayed the healing process; milk hindered the formation of an ulcer and favoured the healing process; whence he concluded meat was injurious and milk beneficial in the treatment of ulcers.

The treatment of duodenal ulcers is the same as that of

gastric ulcers, and no further mention of them would be necessary except for the assertion of some surgeons that whenever a duodenal ulcer occurs an operation is necessary. This is not true. Post-mortem evidence has shown that such ulcers are as likely as gastric ulcers to heal without an operation.

Finally, there is the serum treatment of ulcers of the stomach and duodenum. This fluid is prepared from the serum of horses and given by the mouth three times a day for three weeks. Hort claims for this treatment that it heals the ulcers rapidly; that under its influence there is a speedy cessation of pain and vomiting; that a higher level of nutrition is reached than by any other treatment. He believes this is assisted by the diet given by him, that the meat absorbs the gastric juice and increases the power of resistance to the unknown cause of the ulcers, while the serum acts like a dressing to a superficial ulcer, and assists in the local repair. We are in an age when many diseases are being treated by serums and antitoxins, and by extracts made from animal organs. The serum treatment of ulcers bids fair to become important in the near future.

CHAPTER XIII.

RECTAL FEEDING.

RECTAL feeding is an artificial method of giving food to a patient. It is adopted in cases of acute gastric catarrh, ulcer of the stomach and duodenum, in states of unconsciousness, such as apoplexy, coma, and whenever it is undesirable or impossible to give food by the mouth.

Each meal should consist of not more than five or six fluid ounces. It may be given through a special apparatus, but the less complicated it is the better. Any doctor or chemist can make a simple apparatus that will answer quite well. Take a large rubber catheter (No. 12), join it by means of a bit of glass tube to $2\frac{1}{2}$ or 3 feet of rubber tube of the same calibre, and put a glass funnel into the opposite end. The patient may lie on the back or side, or in the knee-elbow position. The catheter must be carefully insinuated into the bowel, the idea being to get it through the rectum and into the sigmoid flexure of the colon if possible. This is not always easy to do; the catheter may catch against one of the folds of mucous membrane in the rectum, called Houston's valves, and become doubled up. Having got it into position, the funnel should be held 2 or $2\frac{1}{2}$ feet above the hips, the food poured in and allowed to get into the colon by its own weight. It is often a slow business; but the nurse must be willing to spend a little time over it. If the food were injected into the bowels it would probably be returned almost immediately. By allowing it to find its way in by gravity the bowel is not likely to be irritated by its presence, and it will probably be retained. That is the usual mode of intermittent rectal feeding. It is possible,

however, to provide continuous rectal feeding, which requires less attention and is less tiring to the nurse, by fixing the funnel to a stand at the bedside, and applying a clip to the rubber tube to regulate the flow. This can be so regulated that five or six ounces would occupy about two hours in getting into the bowel; and it is probable that the food would be better retained and more nutriment be got out of it than by intermittent feeding.

The rectal mucous membrane becomes very irritable from the frequent passage of the catheter; indeed, it is very tender from the first in some persons. To reduce this irritability it is advisable to add five drops of laudanum to each alternate feed, and also a few grains of common salt and bicarbonate of soda. It is also necessary to wash out the rectum once a day with a boracic lotion or some other mild antiseptic to soothe the irritation and check putrefaction. Furthermore, it is usual to inject into the bowel about a pint of water once or twice a day to reduce thirst.

It is not uncommon for mumps to occur during a course of rectal feeding. The reason for this is not quite clear, but it probably has nothing to do with the rectum at all. The mouth normally contains a lot of bacteria, and when the body is diseased the gums become very sore, and a chronic suppurative process may occur (*pyorrhœa alveolaris*). When mastication is going on, the number of bacteria in the mouth is kept down by various things—*e.g.* by mastication and drinking. But when no food or drink is taken by the mouth the bacteria flourish abundantly, infect the salivary gland, setting up mumps (*parotiditis*), and sometimes ending in suppuration. These symptoms may be prevented by the frequent use of a mouth-wash. If swelling occurs the treatment required will be that for ordinary mumps.

There are various recipes for rectal feeds. The basis of most of them is either plain or peptonized milk; but eggs, beef-tea, meat extracts, peptones, glucose, malt extract, and ordinary sugar are also used. The following are useful examples:—

1. A raw egg well beaten, a cupful of warm milk (plain or peptonized), and a saltspoonful of salt. The addition of

salt assists in the digestion and absorption of eggs, milk, etc.

2. A pint of milk, three raw eggs, a tablespoonful of extract of malt, and a tablespoonful of brandy. It will make four feeds. The extract of malt should be put into the warm milk and egg about ten minutes before the addition of the brandy.

3. One ounce of Carnick's liquid peptonoids or Kemmerich's peptones, the yolk of one egg, $\frac{1}{4}$ pint of milk, 5 drops of laudanum, half a saltspoonful of salt and bicarbonate of soda.

4. A cupful of pancreatized milk, two egg-yolks, a dessertspoonful of glucose syrup, and a little salt.

5. Cod-liver oil, 2 ounces; one egg-yolk; lime-water, 2 ounces.

6. Finely minced meat (beef, mutton, or fowl) 5 ounces, a cupful of milk, and a tube of Fairchild's peptonizing powder; after the material is peptonized, add 2 tablespoonsful of glucose syrup and the same amount of brandy. It will make two or three feeds.

7. A pint of milk and the white of four eggs is pancreatized by means of a tube of powder or some liquid pancreatic extract; it is then boiled to destroy the ferment and sterilize it, and two or three tablespoonsful of glucose and some salt added to it. It will make four feeds.

8. Beef-broth or beef-tea $\frac{1}{2}$ pint, two raw beaten eggs, a wineglassful of white wine, and a saltspoonful of salt.

There is no doubt about the usefulness of this mode of feeding. It will help to carry the patient through a bad time, provided the time is short, say a week or ten days. But we must not be deluded by it, however much we wish to impress our patients with its value and importance. We know very little about digestion in the colon. Until recently it had been denied that digestion occurs in this part of the bowel. But we know that the pancreatic enzymes reach the colon, and trypsin, one of the most powerful digestive enzymes, is to be found in the faeces. But the pancreatic enzymes act best in an alkaline medium, whereas the contents of the colon are slightly acid; therefore there is not

much chance of rapid digestion going on there. On the other hand, we cannot deny that any digestion occurs in this part of the economy. Constipated persons not only retain their food in the colon a very long time, but they extract nutriment from it; indeed, very little more than débris remains in their faeces. There is therefore some hope that food introduced through the rectum will be partly digested and absorbed. Nevertheless, it must be clearly understood that food introduced through a catheter or rectal tube does not get very far into the colon. If it can be got beyond the sigmoid flexure (corresponding externally to the level of the umbilicus or top of the left hip), some good may be done and some digestion take place; but if the food only gets into the rectum no digestion will occur. What, then, is the good of it? Well, some of the liquid, and especially peptonized, food will be absorbed. Not a lot, perhaps; certainly not more than a fourth part of the nutriment required by a person absolutely at rest. Moreover, there is a limit even to the capacity for absorbing liquids. It will be observed that, in spite of the most careful rectal feeding, the patient continues to waste away, and is in a condition of semi-starvation. An examination of the urine shows that more nitrogen is excreted than the patient absorbs; the amount of carbonic acid from the lungs is greater than can be accounted for by the oxidation of the food—both the nitrogen in the urine and carbonic acid from the lungs are derived from the burning of muscle and fat for fuel. Whence it has been said rectal feeding satisfies the mind rather than the body. If we can satisfy the mind we shall do something for the patient's comfort. If we can prevent the sensation of hunger and thirst, we shall do a good deal. Moreover, a gastric case will be free from pain when no food is put into the stomach. But science has proved that when raw milk and egg are given 21 per cent is usually absorbed; when peptonized milk and egg are given, from 30 to 40 per cent is absorbed; when peptones are given, 50 to 70 per cent will be absorbed. Very little fat is absorbed; the figures vary extremely and show an absorption of 2 to 33 per cent, and probably not more

than one ounce of cod-liver oil, liquefied butter or milk fat would be absorbed in a day. On the other hand, various kinds of sugar are taken up readily. When one or two ounces of glucose were used daily in a 10 per cent solution, from 75 to 90 per cent disappeared. It is not certain that all the sugar which disappears from the lower bowel is absorbed; some of it may be fermented. But until this fact is proved, the free use of grape sugar (glucose) or malt sugar (extract of malt) is strongly recommended as a part of all rectal feeds.

CHAPTER XIV.

INTESTINAL INDIGESTION.

MAL-DIGESTION in the bowels is very common. The food may be prepared in the mouth and stomach too imperfectly for its complete digestion in the bowels. All foods are liable to undergo putrefaction in the bowels when the previous part of digestion has not been properly performed. But protein foods (meat, fowl, fish, milk, etc.) are especially liable to undergo putrefaction after they leave the stomach unless they are promptly digested. A peculiar substance called tryptophan is split off from the proteins, and from it are formed indolactic acid and indican, which are absorbed and give rise to indicanuria and symptoms of auto-intoxication. A delay in the completion of digestion in the bowels may be due to some derangement of the other alimentary organs, but especially the liver or pancreas. The patient is usually treated for the consequences. In the first instance these are the ordinary symptoms of indigestion, constipation, or diarrhoea, headache, biliousness, giddiness, nervousness, mental depression or melancholia, neuralgia, neurasthenia, anaemia, chlorosis, etc. After a time, however, various organs not directly connected with the stomach and bowels begin to suffer. The heart and blood-vessels become affected, there being weakness of the muscular portion of the circulatory apparatus, causing a low-pressure pulse (hypotonus) combined with symptoms of neurasthenia; but later on there is a gradual thickening of the fibrous and other tissues in the peripheral arteries and capillaries, which causes the blood pressure to be increased (hypertonus), and in consequence the heart becomes hypertrophied, the vessels sclerosed,

and the kidneys undergo those changes which are found in Bright's disease. Careful observation has shown that these changes are due to toxæmia (auto-intoxication), arising from intestinal indigestion, especially of the proteins in the food. Moreover, it has been shown that the toxæmia is least when the patient is on a vegetarian diet, somewhat greater on a milk diet, much greater on a meat diet, and greatest of all when the diet consists of eggs. It is not to be supposed, however, that indigestion or mal-digestion of fat and carbohydrates does not occur. When the pancreas or liver is diseased the digestion of fats is much delayed ; they become split into fatty acids, which may or may not be of a normal type, and a considerable portion of the unchanged fat passes out in the faeces, and thus much valuable nutriment is lost to the body. The digestion of carbohydrates in the intestinal canal may be defective owing to a deficiency of the pancreatic juice or succus entericus, and any delay in their digestion gives an opportunity for intestinal bacteria to ferment the sugars, cause the generation of gases, and transform starches into irritating acids.

The fact that auto-intoxication (self-poisoning) does not constantly occur in normal individuals is due to several factors. Under ordinary conditions the number of bacteria in the intestines is kept within moderate limits. The liver when in a healthy state has the power of destroying or modifying some of the poisons absorbed from the alimentary canal and eliminating others. Some of the poisons produced are antagonistic to each other. Various poisons arising from the decomposition of food in the bowels are broken down into harmless substances. Cholin and neurin are recognized as agents which produce serious consequences in general paralysis and other nervous diseases. They originate from degenerated nerve-cells. These poisons are also produced in the alimentary canal in consequence of the decomposition of proteins ; under normal conditions neurin is transformed into cholin, and cholin is broken down to ammonia, carbonic acid, and marsh-gas, which are comparatively innocuous. In abnormal conditions such poisons may be absorbed into the blood and carried all over the body.

The products of intestinal indigestion, therefore, are (*a*) gases and acids, (*b*) toxins. The first group give rise to flatulence, irritability, and other signs of indigestion ; the second to toxæmia or the symptoms and consequences of auto-intoxication.

Flatulence in the Bowels.—This is one of the most prominent symptoms of intestinal indigestion. The most important cause of it is the fermentation of carbohydrates with the formation of organic acids, and evolution of gases such as carbonic acid, hydrogen, nitrogen, marsh-gas, and sulphuretted hydrogen. Carbonic-acid gas is formed in large quantities from all kinds of carbohydrate foods, such as bread, sugar, puddings, etc. This gas is very diffusible ; it passes readily through the coats of the alimentary canal into the blood, and is exhaled by the lungs ; it is probable that a considerable amount of carbonic-acid gas is got rid of in this manner, but not all of it. It is a peculiar circumstance that a reverse current of carbonic-acid gas may occur ; when the amount of this gas in the venous blood exceeds that in the bowels—*e.g.*, during mental excitement—a violent attack of “wind” may occur so rapidly that it is impossible for it to arise from the food. In such a case it is believed the gas comes from the blood. Of the opposite character are hydrogen and nitrogen gases ; these do not really diffuse into the blood. On the contrary, they are absorbed more slowly than any other gas generated from the food, and accumulate in the bowels until they are discharged. According to Ruge, who made numerous experiments, hydrogen and nitrogen are produced in greatest abundance when the food consists wholly of milk. These facts explain why some people have flatulence after milk more often than after other foods. Marsh-gas arises in the bowels from the mal-digestion of meat, beans, peas, lentils. It is more rapidly absorbed into the blood than nitrogen or hydrogen, but only one-third as rapidly as carbonic acid. The amount produced from peas and beans is sometimes very great, and it accumulates in the bowels and causes discomfort until it is absorbed or expelled. Sulphuretted hydrogen is generated from various foods. The amount detected in the gases of the alimentary canal is very small, but unfortunately it is

absorbed more rapidly than any other gas and is very poisonous. Owing to the rapidity of absorption it is possible for the amount produced in a definite time to be underestimated in the analyses which have been recorded. The effects observed after inhalation of this gas are headache, vertigo (dizziness), nausea, and a sense of oppression in the chest and abdomen, followed by death when the subject is long exposed to it. It is probable that some of the symptoms of intestinal indigestion are due to these gases, the relative absorbability of which is as follows : nitrogen 1, hydrogen 2, oxygen 28, marsh-gas 39, carbonic-acid gas 100, and sulphuretted hydrogen 300.

Treatment of Intestinal Flatulence.—It is advisable that patients who are much troubled by this symptom of intestinal indigestion should avoid the foods which are most liable to be decomposed in this manner. In particular, the amount of carbohydrate foods should be reduced to a minimum until the normal condition is recovered. There is, however, a great difference in the effects of carbohydrates. The sugar of milk is very prone to undergo decomposition, being transformed into lactic acid, and the latter into butyric acid, hydrogen, and carbonic-acid gas. Cane-sugar (ordinary loaf or granulated sugar) gives rise to the same acids and gases. But the carbohydrates which are usually eaten in the greatest amount, and are the most troublesome in this respect, are bread, potatoes, puddings, legumes, cauliflowers, cabbage, etc. A large proportion of these substances, before they are completely digested, is carried far down into the ileum, where the alkaline secretions and slower peristaltic movement are favourable to the growth of bacteria and decomposition of food. Rice, sago, tapioca, and arrowroot, on the other hand, are more rapidly digested, and to a great extent are absorbed in the upper reaches of the bowel, and flatulence does not rise from them to the same degree. The best treatment, therefore, is to stop all forms of carbohydrates for a few days, and during this period allow only meat, fish, or fowl, with some light vegetable such as boiled lettuce, spinach, or onion, a jelly, and some hot water to drink. After a period of five to seven days we may add

boiled rice, next a pudding of rice, sago, or tapioca, crisp dry toast, or a rusk. Bread and potatoes should be avoided for a few weeks ; and all stringy, fibrous, or flatulent vegetables, such as cabbage, turnips, or Jerusalem artichokes, may have to be permanently left out of the diet.

INTESTINAL AUTO-INTOXICATION.—It has been stated that the products of indigestion in the bowels are (*a*) gases and acids, (*b*) toxins. The former have been considered. It has also been shown why auto-intoxication does not constantly occur. We must now state the conditions in which auto-intoxication does occur, the consequences of it, and what can be done to prevent it.

The causes of auto-intoxication are many ; several of them have already been dealt with. They are : (*a*) The consumption of too much protein food, or such foods in an unsound condition ; (*b*) a defective action of the nervous system, leading to a failure of the processes of digestion, torpidity of the bowels, constipation, fermentation, and putrefaction within the alimentary canal ; (*c*) dilatation of the stomach and hypochlorhydria ; (*d*) duodenal atony and catarrh ; (*e*) atony and catarrh of the small or large intestines. Moreover, there may be a failure on the part of those organs whose duty it is to destroy or eliminate from the body the toxic products of digestion. When the bowels act in an ordinary manner, they carry away from the body a large amount of the toxic materials produced during digestion, including leucomaines and ptomaines. Constipation, which is one of the symptoms of intestinal indigestion, therefore tends to the absorption of poisonous materials and auto-intoxication. The liver normally destroys any leucomaines, ptomaines, purins, and other poisonous bodies which are absorbed ; but the amount absorbed may be too great to be disposed of in this way ; or the functions of the liver may be disturbed, and in either way auto-intoxication will arise. The kidneys usually excrete more than two-thirds of the total amount of waste materials absorbed from the alimentary canal or produced by the processes of metabolism. These substances include urea, uric acid, purins, indican, sometimes leucin and tyrosin, colouring

matters, and mineral substances. The skin eliminates water, salts, a little urea, and those volatile and poisonous bodies which give a characteristic odour to some persons. The lungs excrete, besides water, carbonic-acid gas and other gases, certain substances of the indol group, which, if they are in abnormal amount in the blood, give an unpleasant odour to the breath. Thus we perceive that auto-intoxication is due to excessive production of poisonous substances in the alimentary canal and, when the organs of excretion are disturbed, defective elimination of these substances.

The commonest symptoms of auto-intoxication are those of intestinal indigestion previously mentioned—viz., indigestion, bilious attacks, headache, migraine, vertigo, neuralgia, neurasthenia, general debility, and other symptoms detailed in connexion with disturbance of the gastric and intestinal functions in the preceding sections.

The consequences of auto-intoxication are numerous and may be classified as follows : (1) Neurasthenia, polyneuritis, migraine, insomnia, hypochondria, and many other nervous complaints ; (2) disturbances of the nerves which govern the circulation, especially causing palpitation and irregularity of the heart, pains in the cardiac region (false angina and other cardiac neuroses), cold hands and feet, etc. ; (3) chronic bronchitis and asthma ; (4) gout, rheumatism, and rheumatoid arthritis ; (5) skin diseases, such as chronic urticaria, erythema, acne rosacea, eczema, etc.

Many of these diseases are associated with a steady and persistent auto-intoxication ; so long as the toxins are absorbed, the disease remains ; when the auto-intoxication is stopped, the disease tends to get well. But probably no part of the system is more affected by the absorption of toxins than the heart and blood-vessels. The multitude of alimentary poisons has been divided into two classes : (a) those which have a relaxing effect on the vessels, and lower the blood pressure (*hypotonus*) ; (b) those which constrict the blood-vessels, and raise the blood pressure (*hypertonus*). The poisons, being absorbed into the blood, circulate through the vessels to all parts of the body ; but they affect

the tissues of the blood-vessels just as they do other tissues. Some of them relax these tissues and cause the low blood pressure, indicated by a soft and compressible pulse; others by their constant presence irritate the coats of the vessels, and such irritation leads to new cell-formation and thickening of the arteries or arteriosclerosis, indicated by a firm and incompressible pulse, which becomes more or less like whipcord. Such poisons increase the blood pressure. When an infusion made from decomposing meat is injected into the blood, the tension of the vessels is speedily increased, as it is by ergot, digitalis, and adrenalin, and remains so until the toxins have been destroyed or eliminated from the system. In fact, the most pernicious toxins which enter the body arise from the decomposition of protein foods; and those arising from animal proteins are said to be more poisonous than those of vegetable origin. A noted physician has said that every particle of protein consumed above 70 grammes daily is reduced to leucin, tyrosin, indol, skatol, phenol, cresol, muscarin, cadaverin, pepto-toxin, neuridin, neurin, cholin, mydalein, and special toxins from particular foods—e.g., tyrotoxicon from cheese, gadin from codfish, scombrin from mackerel, etc. There is no doubt about the production of these poisons in the body; but it is very doubtful whether everybody at all times produces such toxins whenever more than 70 grammes is consumed. On the contrary, there are many people who can safely consume twice that amount without suffering from toxæmia; and it is equally certain that many people who consume less than 70 grammes a day suffer from toxæmia and present well-marked signs of auto-intoxication.

The treatment of auto-intoxication consists of preventing the absorption of toxins from the bowels, and promoting their elimination by the various organs of excretion. It is necessary to determine in each case what conditions exist likely to favour auto-intoxication. An inquiry into the amount of protein consumed will settle the question of excessive consumption. The gastric and intestinal functions will next be examined; dilatation of the stomach and hypochlorhydria will be sought for; duodenal and intestinal

catarrh ; deficiency of nerve power or control over the digestive processes and movements ; and deficiency in the elimination of waste products will be determined. Each of these conditions requires the treatment appropriate to it.

The general treatment of auto-intoxication consists of regulation of the diet to suit the condition. The food must be as free as possible from injurious bacterial organisms. It is, of course, impossible to eliminate bacteria from the food. Milk teems with them ; a small piece of butter contains millions ; a cubic inch of cheese contains an almost innumerable quantity. Meat which has been killed a short time and all other animal foods contain micro-organisms which are not necessarily of a putrefactive character. There are benign as well as malign bacteria. There is no need to destroy the beneficent varieties ; indeed, the sour-milk treatment consists of the introduction of such bacteria ; but it is essential to exclude the others. Therefore the food should be fresh.

The next point is, the amount of food consumed must be moderate only. In the majority of cases it is necessary to reduce the quantity. The alimentary organs are over-taxed, and the digestion of food is delayed, thereby favouring fermentation and putrefaction. We know that the body can manage for a time with a reduction in the amount of food consumed ; but it is better to reduce all kinds of food rather than run the risk of excluding any kind of food which is not injurious. The amount of protein should be about 80 grammes for a man and 65 to 70 for a woman, and the food should provide a total amount of energy equal to 2000 or 2200 calories, which will suffice, at any rate during the treatment.

It is not necessary to exclude animal food altogether. It has been said that animal proteins are more prone to decomposition than vegetable proteins. But it should be remembered that both kinds of proteins are composed of amino-acids, frequently of the same sort ; in fact, the animal proteins of our food were formed out of vegetable proteins ; and, in spite of the arguments of vegetarians, it has never been shown that animal proteins behave in the body

differently from vegetable proteins. Animal proteins are easily digested and more prone to decomposition. Vegetable proteins are not so easily digested ; they are contained in cells which resist the action of the digestive and bacterial enzymes ; they are not so easily putrefied ; and for the same reasons they are of less value to the body.

In the treatment of these cases we may allow fresh meat or chicken at one meal a day, preferably the mid-day meal, and not a very large helping. We should forbid pork, veal, game, sweetbread, smelt, brain, hashed meat, entrées, stews, meat pies, sausage, potted meat, and other preparations of meat, including soup, broth, rich gravy, and meat extracts. Fish should not be allowed unless it is perfectly fresh. Sole, plaice, whiting, and fresh haddock may usually be permitted ; brook trout and other fresh-water fish may be eaten by most people if they are cooked within a few hours of being taken from the water. The patient may be encouraged to get his own proteins by fishing and shooting. Pheasant, wood pigeon, and grouse may be eaten quite fresh, but not after being hung for several days. Eggs should be avoided in bad cases of auto-intoxication, as many people are made bilious thereby, and they are very poisonous to some others. Ripe and old cheese must be forbidden. Peas, beans, lentils, and nuts are the chief vegetable sources of protein ; and may be taken by all patients who can digest them. The legumes must be well cooked, or they can be used in the form of pea-flour or lentil-flour to thicken mutton broth or chicken broth. Nuts should be ground in a mill ; they are less likely to cause pain and discomfort when they form a chief portion of a meal than when a few only are eaten at the end of a large repast. The tendency to constipation may be avoided by a large allowance of fruit.

What has already been said about intestinal flatulence holds good now. Rice, sago, tapioca, and arrowroot give rise to little fermentation ; bread, potatoes, sugar, and jam readily ferment ; peas, beans, and vegetables are very flatulent. As a general rule the patient may eat boiled rice with the animal food, and fresh vegetables on alternate days,

in place of bread and potato. Puddings of rice, sago, tapioca, or arrowroot are usually allowable, but they should not be made very sweet. Fruit and nuts may form part of the diet unless there is diarrhoea or some other contra-indication. A little red wine, such as Burgundy, in some cases a little brandy or whisky, may be allowed, but one must be careful to whom they are permitted. Tea, coffee, and plain water should form the chief beverages. The following diet list will indicate the quantity of foods which may be taken so that the proper amount of protein and energy is obtained:—

PROTEIN, 10 GRAMMES IN EACH HELPING.

150	calories	:	Cooked beef, average $1\frac{1}{2}$ oz., without bone.
75	"		Sirloin of beef, baked, $1\frac{1}{2}$ oz., without bone.
80	"		Steak, broiled, $1\frac{1}{2}$ oz., without bone.
132	"		Mutton, roast leg, $1\frac{1}{2}$ oz., free from bone.
150	"		Mutton, roast loin, fat removed, $1\frac{1}{2}$ oz., without bone.
60	"		Fish, average 2 oz.
54	"		Chicken, without bone, $1\frac{1}{4}$ oz.
205	"		Milk, $\frac{1}{2}$ pint.
95	"		Egg, one large one.
100	"		Egg, one large one, scrambled, buttered or omelette.
80	"		Oysters, 10.

PROTEIN, 5 GRAMMES IN EACH HELPING.

136	calories	:	Bread, 2 oz.; half a roll; $1\frac{1}{2}$ oz. crackers or plain biscuits.
150	"		Macaroni or vermicelli, $1\frac{1}{2}$ oz.
150	"		Oatmeal, $1\frac{1}{2}$ oz.
150	"		Pearl barley, 2 oz.
180	"		Potatoes, three moderate-sized ones, 10 oz.
160	"		Potatoes, mashed and creamed, four tablespoonsful.
95	"		Dried peas, beans, or lentils, two tablespoonsful, 1 oz.
100	"		Boiled rice, sago, or tapioca pudding, $3\frac{1}{2}$ oz.
70	"		Cabbage, cauliflower, mashed turnip, 10 oz.

CONSTIPATION.

People who are afflicted by habitual constipation suffer from headache, loss of appetite, foul breath, and many signs of indigestion. The term "constipation" is a relative one. One daily evacuation of the bowels may be regarded as

normal ; but some people only feel well when they have two or three movements a day. Others feel well who are moved every second or third day, and do not feel well if they are moved oftener. The former usually have a healthy appetite and take ordinary foods to satisfy it ; those who are moved two or three times a day probably take somewhat more food than they need, or the food itself is of such a character that it leaves a large residue. Many constipated persons have a poor appetite or the food consumed by them leaves very little residue. Nevertheless, it is observed that persons living on precisely the same kind of food, and eating about the same quantity, differ from each other in regard to their evacuations. This is probably due to the fact that in one person the mucous membrane is more sensitive to the presence of food, and in the other it is sluggish, having little sensibility and not readily provoked to peristaltic action.

The consequences of the retention of faeces are equally varied. In one person there may be a general unfitness for the duties and pleasures of life ; in another the presence of faeces in the flexures of the colon produces considerable discomfort and puts the patient in a disagreeable state of mind ; another may develop "food fever". The chronic and durable effects of constipation are more serious ; chronic intestinal catarrh, mucous and membranous colitis, and other affections of the alimentary canal, are the local effects ; all those diseases which have been mentioned as the results of intestinal indigestion are numbered in the general consequences of constipation.

The causes of constipation are many : Habitual neglect of the daily call of Nature ; atony of the muscles of the bowels, particularly of the colon and rectum, common in chlorotic girls, dyspeptics, and persons of sedentary occupation ; the character of the food—milk diet, meat diet,—absence of those materials which stimulate intestinal movement, such as vegetables and fruit, and a deficiency of liquids ; painful affections in the neighbourhood of the rectum and anus, piles, fissure, chronic metritis, salpingitis, painful affections of the ovaries, bladder, etc. ;

pathological affections of the bowels : (1) spasmodic stricture, arising from hypersensitiveness of the mucous membrane, excoriations by rough and hard substances in the food, ulcers ; (2) organic stricture due to malignant disease or the healing of ulcers—dysenteric, syphilitic, typhoid, or tuberculous ; (3) compression of the bowel by abdominal tumours, traction by such tumours forming a kink in the tube ; (4) kinks caused by bands and adhesions ; (5) torsion or twisting of the bowels, internal strangulation, intussusception ; impaction of foreign bodies. The distinctly surgical cases will be left out of this discussion, except in so far as the condition may be influenced by the food or ordinary methods of treatment.

Constipation is one of the consequences of human progress and civilization. In a state of nature men eat their food after very little preparation. But civilized people wish it to be not only well cooked but carefully prepared, in order that it may please the æsthetic sense, which is one of the marks of our progress. Bread was originally made from grain reduced to a coarse powder in a quern or primitive mill, and very little, if any, of the bran was removed. To-day we have it ground in a steel mill, and every particle of bran is removed to make fine flour and produce a white loaf. The influence of mankind on the development of his food is shown in many of the products of the garden. Most of our vegetables and fruits have been evolved from small and comparatively unpalatable substances, containing a considerable amount of indigestible fibre, which could not fail to act as a stimulus to peristaltic action in the bowels. The cabbage which weighs several pounds has been developed from a colewort weighing only a few ounces ; and the cauliflower from a colewort flower only weighing a few grains ; celery from an acrid and unpleasant plant growing wild in our fields ; potatoes from a small and bitter root in South America ; apples from the wild crab of our woods ; and plums from the sour sloe. The great changes produced in our food by art and cultivation, the absence of coarse fibre, the reduction in the amount of organic or vegetable acids and salts, are largely responsible for the predisposition to atonic constipation in human beings living in civilized

society. In the treatment of constipation of the ordinary type, therefore, we must get back to Nature. The patient must consume all those articles of food which contain the greatest amount of cellulose (fibre), vegetable acids, salts, and other substances which stimulate the bowels to action. He should eschew fine white bread and take in its place wholemeal or brown bread. Oatmeal, especially coarse meal, such as "Miller's pride," should constantly form part of one meal a day, preferably breakfast. It may be taken as porridge, Yorkshire parkin, oatmeal biscuits, or oatmeal pudding. Pearl-barley pudding is also useful. Rye bread or cakes and buckwheat cakes are equally useful. Dried peas and beans leave a large residue, and should frequently be consumed. Bread and cakes containing fruit (currants or raisins), treacle, and ginger have a slightly aperient effect.

All vegetables may be consumed, especially those usually considered fibrous and indigestible: cabbage, kale, savoy, brussels sprouts, cauliflower, spinach, onions, leeks, carrots, turnips, swedes, Jerusalem artichokes, skirret, sweet potatoes, kidney beans, broad beans, green peas, etc. Also salads containing lettuce, endive, dandelion, sorrel, radishes, green onions, beetroot, tomato, mustard and cress, watercress, and other green vegetables, will assist in the cure. Fruit may be taken in abundance, raw and cooked, especially apples, pears, plums, prunes, figs, dates, gooseberries, cranberries, strawberries, raspberries, currants, grapes, oranges, bananas, etc. Puddings made with a pastry crust, such as boiled apple puddings, rhubarb puddings, or "dumplings" containing any of the foregoing fruits may be taken. Jam, marmalade, syrups, sugar, honey, are laxative.

It should not be imagined that the diet is to be absolutely "vegetarian"; that is unnecessary. The patient may have a moderate amount of any meat, fish, or bird. Fat meat, butter, and cream are useful. Boiled eggs are constipating to many people; those fried in fat, buttered eggs, and omelettes are not usually constipating.

The patient is not compelled by this complaint to give up any kind of food, unless it causes indigestion, biliousness, or other unpleasant symptom. But it will be understood that

if a sufficiency of the above-named foods is taken, the patient will have no necessity for those which leave little residue. If milk puddings, blancmange, and custard are eaten, some fruit or vegetable must form a part of the meal. The same remark applies to concentrated foods like potted meat, fish, or fowl; *foie gras* and *caviare* may be useful, if they do not cause biliousness. Nuts are usually taboo; but it is unnecessary to exclude them when an abundance of fruit or vegetables is consumed. Jellies are useless to such patients; but agar-agar (sold as Chinese or Japanese gelatine) is a useful remedy for constipation, very little of it being digested.

The "grape cure" may be employed. This consists in the consumption of several pounds of grapes daily, beginning with about two pounds and increasing the quantity to six or more pounds a day. The treatment can be carried out at home; but many people prefer to go to the Tyrol and other Continental countries where there are proper establishments for this treatment.

The patient must take plenty of fluids. Water may be taken cold or hot to the extent of three or four pints a day, unless there is some contra-indication. Special table waters may be used, such as Bourne, Malvern, Perrier, Apollinaris, Salutaris, Puralis; or the patient may go to Leamington, Bath, Harrogate, etc., to "drink the waters". Fruit juices will assist in the cure, *e.g.* grape-juice (*Vin de vie*), "rough" cider, rhubarb juice, and the juice of elderberries, currants, plums or other fruit may be used to flavour water. With regard to alcohol, the less the patient takes the better; red wines should be avoided; a little white wine (Chablis, Moselle, Sauterne) may be allowed. Ale and stout are not constipating. The morning cup of coffee is laxative; tea, especially strong tea, is rather binding.

Stricture of the Bowels, causing constipation, whether of a spasmotic (spastic constipation) or pathological character, requires very different treatment. In these conditions we have to avoid irritating the mucous membrane or leaving a large residue of food. The diet must be soft, bland, and somewhat concentrated. Animal foods should form a considerable share of each repast. Scraped meat, raw meat,

meat juice, potted meat, tongue or chicken are useful. Ordinary meat should be deprived of every particle of skin and gristle. Fruits should be deprived of skin and seeds. Green vegetables should only be given after they have been reduced to a purée or consommé. Sago, rice, tapioca, and arrowroot puddings are suitable. Jellies of all kinds are good. Junket, custard, eggs, sour-milk, kefir, cream, cream cheese, fine white bread, and potato (mashed and creamed) will do no harm, perhaps ; but brown bread, oatmeal, turnips, carrots, swedes, salad, and ordinary vegetables (except as a purée) must be forbidden.

In certain cases an operation is necessary for the removal of constipation. Colectomy is an operation for the removal of a part of the colon for chronic constipation and malignant or fibrous stricture of the bowel. Resection of part of the small or large intestines may have to be done for stricture, gangrene, strangulation, intussusception, or malignant growth. Colotomy either through the loin or the anterior wall of the abdomen may have to be performed to make an artificial anus. After these operations the food should be much reduced in bulk for about a week. It may consist of milk, milk and barley-water with sugar, milk pudding (rice, sago, etc.), custard, junket, jelly, a little fish, scraped meat or a poached egg. The amount of milk should not be large, not more than two pints a day. Nutrient enemata may be given when the operation has been upon the small intestines ; in such cases also thirst may be relieved by enemata of warm water. When the operation has been on the colon no enemata should be given. After colotomy the diet must be of a similar character, but much milk cannot be allowed because it tends to the formation of scybala ; oatmeal, vegetables and fruit, on the other hand, may soon form a liberal portion of the diet.

DIARRHŒA.

Like constipation, diarrhoea is a relative term. People who are regularly moved once a day would consider several movements to constitute diarrhoea. Other people are usu-

ally moved as many times a day and do not feel well when they are not. Diarrhoea is a too frequent evacuation of the bowels. It may be due to many causes, which can be classified as : (a) mechanical ; (b) digestive, toxic ; (c) pathological—(1) bacterial, (2) nervous, lienteric, (3) catarrhal, (4) other pathological causes. Acute diarrhoea is usually associated with some impurity of the food, water, or air.

Mechanical causes arise from an unusual constitution of the food. The consumption of unripe fruit, coarse vegetables, or an extra amount of indigestible cellulose, for instance in oatmeal, or irritation by mercury or some other drug, are included in this group.

Digestive causes arise from the character of the food or the digestive secretions. Indigestible foods rank amongst the commonest causes of diarrhoea. Pork, veal, and similar materials set up diarrhoea quite readily in some persons. The freshest of eggs will cause others to have frequent movements of the bowels, attended by the signs of an acute diarrhoea ; but a failure of the proper secretions of the digestive organs also causes it. This may begin in the stomach. If there is a deficiency of hydrochloric acid the food may be propelled into the bowels in a half-prepared condition. There may be a deficiency of bile, pancreatic secretion, or succus entericus, and the resulting diarrhoea has been called "intestinal fermentation dyspepsia". The presence of an undue proportion of organic acids, either in the food consumed or originating from fermentation in the bowels, will give rise to diarrhoea, and this condition has been called "acid jejunal diarrhoea". The toxic causes of diarrhoea are those of poisoning, auto-intoxication, uræmia, and septicæmia. Diarrhoea due to this group of causes is sometimes salutary, and may be considered "compensatory" in character, as in the crises of Bright's disease.

Bacteria are responsible for a very large proportion of cases of diarrhoea. In ptomaine poisoning, which is frequently accompanied by diarrhoea, the poisons are produced by the action of bacteria. Animal foods, such as meat, game, fish, eggs, and their numerous preparations, are prone to undergo decomposition by the ordinary putrefactive or-

ganisms; but other bacteria have been found associated with animal foods in the various epidemics of food poisoning, notably *B. botulinus*, *B. enteritidis* of Grtner, *B. enteritidis sporogenes* of Klein, and *B. aertryke* of Durham. Milk, cream, ice-cream, cheese, and other substances made from milk and eggs may contain the foregoing bacteria, besides numerous streptococci and staphylococci.

It has been thought that the excessive heat of summer has much to do with the causation of diarrhoea. There is no clear evidence that heat alone can cause it. When diarrhoea is due to atmospheric changes, such as a chill, the attack is more often of the nature of acute intestinal catarrh, like a cold in the head. Without the action of the intestinal muscular walls diarrhoea could not occur. This action may be excited by a chill. Moreover, the intestinal muscles are under the influence of nerves which are exceedingly sensitive and are excited by changes of temperature. But it is probable that the heat of summer, which is favourable to the production of bacteria, is more effective when combined with drought, dust, and other means of spreading bacteria among our food. Pathogenic organisms are distributed by air currents, dust, flies, etc. The epidemics of summer diarrhoea, especially among infants, beginning in the middle of July and extending throughout August, are not essentially due to the heat. Such diarrhoea is usually a bacterial disease. The faeces normally contain vast quantities of bacteria, but usually these have very little power of causing disease, or they are prevented from so doing by the healthy condition of the mucous membrane. But if the mucous membrane, irritated by improper food, becomes congested or sheds patches of epithelium, the ordinary colon bacillus is capable of causing diarrhoea; it has been stated that 25 per cent of cases of diarrhoea in breast-fed children are caused in that way. Uncommon micro-organisms of the group of colon bacilli have been found in many diarrhoeal motions, whence it has been concluded that such bacteria can change their character with the circumstances and surroundings. In addition to these, various streptococci, staphylococci, the proteus bacillus, the bacillus of Shiga,

and other micro-organisms gain entrance to the body by the air, or more probably by pollution of the food. One of the commonest causes of such pollution is the ordinary house-fly, an insect which is most filthy in its habits, and, although a scavenger, wanders from one article to another irrespectively and pollutes whatever it touches.

Water and other fluids may be markedly contaminated by such micro-organisms. Liquids are the means of carrying bacteria of many kinds into the system. Where the gastric functions are perfect a large proportion of such bacteria are destroyed by the hydrochloric acid of the stomach, but when the organism is depressed by excessive heat and various other causes the hydrochloric acid becomes deficient or the number of bacteria is disproportionate to its disinfecting power. It was formerly thought that cholera was transmitted through the air, like infectious fevers, but the investigation by Hart showed that "we eat or we drink cholera," and the same is true of dysentery and enteric fever.

The influence of the nervous system over intestinal movement and secretion has been referred to. Many cases of diarrhoea are due to this, the exciting cause being mental agitation, emotion, worry, anxiety, etc. To this group probably belongs the peculiar form called "lienteric diarrhoea". The common symptom of this diarrhoea, to use a patient's phrase, is that "the food goes through the bowel as soon as it is eaten". This, of course, is an exaggeration, but there is some foundation for the popular description. The consumption of food always starts a peristaltic movement of the bowels which goes on at intervals until the meal is digested. But in the condition of lientery these movements are more powerful and prolonged, with the consequence that an evacuation of the contents of the colon is provoked in a short time. The exaggerated movement drives food along the bowels quickly, so that a considerable portion of it speedily arrives in the ileum in a semi-prepared form. In course of time the irritation produced by such badly prepared food may cause enteric catarrh, and the lienteric diarrhoea tends to become chronic diarrhoea of a catarrhal type.

The diarrhoea of intestinal catarrh is the result of intes-

tinal indigestion and fermentation in almost all chronic cases. An acute catarrhal enteritis is often due to the same causes as acute gastric catarrh and runs concurrently with it. In chronic catarrhal enteritis diarrhoea frequently alternates with constipation; in other cases there may be continuous diarrhoea. In addition to these causes of diarrhoea there are cholera, dysentery, sprue, tuberculosis, syphilis, various ulcerations, and sometimes cancer.

The chief symptoms indicative of diarrhoea are frequent stools and attacks of pain. The stools may be of an ordinary character, but loose or sloppy; they may be acid and fermented, containing some undigested food, foul smelling, green, or mixed with visible mucus. The attacks of pain vary in severity and are sometimes so intense that the skin is bathed in perspiration, while the patient rolls in agony; there is no abdominal tenderness; indeed, the pain is usually relieved by pressure or friction. If these attacks of torment affect the colon they produce a speedy and copious evacuation; if they affect the ileum or jejunum, vomiting very commonly occurs. Diarrhoea, cholera, and dysentery are most common in the summer and autumn, being promoted by heat or alternately hot and wet weather, checked by heavy rain and cold. They most frequently affect those persons whose health is broken down by disease, debility, insufficient food, or improper modes of feeding. In infantile diarrhoea several important symptoms occur: collapse, loss of elasticity of the skin, and rise of temperature. The collapse is due to the pain, absence of food, depressing conditions, and, above all, to the absorption of toxins from the alimentary canal. The loss of elasticity of the skin is not fully explained, but is due to a combination of the same causes; it is a very grave sign. The stage of collapse is indicated by coldness of the surface, rapid and feeble pulse, pinched features, dark rings round the eyes, blue finger nails, sighing respiration, etc. If the patient passes through this stage it will be succeeded by a rise of temperature and a more or less febrile aspect. These cases resemble Asiatic cholera in the occurrence of a cold stage followed by a hot stage; but it is seldom that they present the rice-water stools

characteristic of cholera, or the free discharge of blood so clearly indicative of dysentery.

In ptomaine poisoning there may be sickness, purging, cramp of the extremities, pains and spasms in the abdomen due to tormina, with the signs of collapse already described ; in other cases the collapse may be replaced by extreme muscular weakness, numbness of the limbs, and a feeble action of the heart, followed by muscular twitchings like those of strychnine poisoning or uræmia, and sometimes epileptiform convulsions, terminating in coma. The epidemics of food poisoning occasionally reported all have their origin in the production of ptomaines before the food was consumed. They have been connected with meat, sausages, potted meat, meat pies, ice-cream, mouldy bread, bread puddings, tinned foods, old cheese, oysters, mussels, whelks, crabs, lobsters, etc.

THE TREATMENT OF DIARRHŒA.—A discovery of the cause often gives a clear indication of the method which should be adopted in the treatment. When it is known that the ailment arises from the consumption of some article of food, the sooner the irritating cause is removed the better it will be for the patient and the more rapidly the disease will abate. Sometimes the only treatment required for an attack of diarrhoea is a dose of castor oil, tincture of rhubarb, or other homely remedy to clear out the offending material. The patient may raise an objection to such treatment on the ground that she has already suffered from more than enough pain and purging. It may be sufficient to assure the patient of the correctness of this treatment when we say that, unless this method be adopted, some remnants of the irritating substance will probably remain in her interior and cause trouble for days or a week ; whereas the administration of a proper aperient will bring speedy relief. A "proper" aperient for such a case is one which has a two-fold action—a primary aperient effect, and a secondary astringent effect, such as rhubarb, castor oil, and a few other drugs. The same remedies are sometimes administered to infants and young children ; but it has become the custom during late years to wash out the alimentary

canal of infants daily, during an attack of diarrhoea, with warm boracic lotion ; thus removing decomposing foods and bacteria, and at the same time soothing the irritable mucous membrane.

If the patient is prostrated by pain and purging, she should be put to bed, and have some warm applications applied to the abdomen and feet. A dose of brandy or sloe gin, one ounce in some hot water, may now be given ; a single dose will often stop diarrhoea. There is no doubt about the efficacy of these remedies. Gin contains several aromatic carminatives, and brandy various ethers, besides the alcohol, which check abdominal pain, moderate the irregular and violent movements of the bowels, prevent cramp, and incidentally improve the general condition by removing lowness and depression.

The kind of food and its administration has to be carefully considered. In many cases it is advisable to withhold all food for a day or two. It is better to give the stomach and bowels a rest, so that the acute inflammatory or catarrhal condition may subside ; this will take place speedily, providing the irritation is not kept up by the presence of food. There are, however, very few people who have the moral courage to go without food, if they can take it and keep it down. Moreover, there are some foods which are obviously useful in checking the diarrhoea. These are preparations of starch—such as arrowroot or cornflour (corn-starch)—and albumen, of which the best and handiest example is the white of eggs. A cupful of milk, thickened with arrowroot or cornflour, flavoured with nutmeg or cinnamon, a little sugar, and the white of a raw egg stirred into it when it is about to be eaten, makes an admirable food for most cases of diarrhoea.

In more severe cases it would obviously be impossible for the patient to consume so much as a cupful of milk and arrowroot at one time. We must treat such patients in much the same way as that described for acute gastritis. Begin by giving only a few spoonfuls of milk and barley-water, milk and lime-water, milk and arrowroot, isinglass jelly, white of egg and lemon-water, ordinary whey, alum

whey, tamarind whey, albulactin or glaxo dissolved in water or whey, etc. Barley-water being added to the milk prevents the formation of curds and assists in allaying the irritation. Lime-water has a similar effect; moreover, it checks muscular action in a manner similar to chalk mixtures, it neutralizes the organic acids which irritate the mucous membrane, and produces an insoluble soap which it is hoped may form a thin pellicle over the mucous membrane and protect it from irritation. Citrate of soda prevents the formation of curds in milk. Albulactin and glaxo are protein foods which do not form curds. Alum whey is astringent, and therefore tends to bind the bowels while affording the patient nutriment. It should, of course, be understood that the smaller the amount of food taken the more often it must be taken. A teaspoonful of milk every five minutes would only amount to 36 ounces in twenty-four hours. But under such treatment the vomiting will cease, and as the symptoms abate a larger amount of the same kinds of food may be given. But we must proceed cautiously. If an acute catarrhal or inflammatory condition of the bowels exists, as frequently happens in diarrhoea, we must avoid giving much carbohydrate food for a time, owing to the tendency of such materials to undergo fermentation. When carbohydrates are given in such cases they should be peptonized or semi-digested—e.g., Benger's food. It is, perhaps, better to keep such patients entirely on protein foods for a time, and milk is by far the best; the formation of curd being prevented as before by adding citrate of soda, lime-water, or barley-water. Junket may be given freely because the milk is already coagulated, and it is improbable that such milk will form hard curds in the stomach. Custard may also be given if eggs do not disagree with the patient, and later on poached egg and toast. Jellies are useful. By and by we may allow some light broth made of veal, mutton, or chicken, but we must prohibit the use of beef-tea, meat extracts, and the proprietary essences of meat for some time, because they irritate the bowels and often cause diarrhoea.

If the diarrhoea has been due to the consumption of

animal foods which were unfit for use, tinned meat, fish, pastes, meat-pies, etc., as in ptomaine poisoning, the best diet is a combination of milk and carbohydrates. The milk may have some rice boiled in it (rice-milk), or it may be thickened with arrowroot, cornflour, Benger's, Savory and Moore's, Neave's, or other farinaceous foods. The white of one egg can be given two or three times a day mixed in such foods, and the addition of nutmeg or cinnamon powder will not only give flavour, but carminative properties to the diet. Sometimes milk really disagrees with such patients. It may then be replaced partly by Sanatogen or Plasmon, Albulactin or Glaxo, and some rice or sago may be cooked in water until it is a jelly and eaten with cream. Such patients may also be allowed some of the least irritating meat preparations, as chicken or mutton broth, thickened with baked flour or arrowroot, Plasmon beef jelly, Brand's essence of beef, and Mosquera's beef jelly.

When the diarrhoea is passing off the return to ordinary diet should be gradual. A little clear soup or broth with a slice of toast may form an early meal ; this may be followed by some jelly, custard, rice pudding, or blancmange. On the following day sole, plaice, and a mashed potato may be taken ; and the next day some boiled mutton or fowl. But the patient must beware of hurry ; the old rule of *festina lente* should not be broken. For some time the appetite should be restrained, especially for uncooked fruit and vegetables, brown bread, pastry, pickles, and other articles which are likely to irritate the tender mucous membrane. An unsuitable diet might transform a simple diarrhoea into a chronic enteric catarrh.

The above is an outline of the treatment of diarrhoea in general. It is not necessary to say much about special forms of the disease. When diarrhoea affects the residents of hot countries they should retire to bed and have only a milk diet, for a diarrhoea which appears to be simple may be of a specific character. If it is of the nature of cholera the treatment required is that for diarrhoea of bacterial origin. The vomiting may be checked by ice, ice-water, effervescing draughts, champagne, or brandy and soda. At first the diet

should consist of whey (alum whey, tamarind whey), buttermilk, kephir, cocoanut milk. If these things are not at hand ordinary milk and citrate of soda or lime-water may be given. White of egg and lemon-water will assist in checking the sickness and at the same time introduce some food. The use of beef-tea and meat extracts is forbidden, but the stimulating effects of creatin (one of the substances in extract of meat) may be advantageous when the patient is collapsed; in such cases some Brand's essence, Valentine's meat juice, or Bovinine may be given. The condition of collapse may also be met by brandy and other stimulants, drugs, and saline injections into the armpits or other subcutaneous tissues. Various other aids to recovery may be employed, such as a mustard plaster over the heart or epigastrium, a warm application to the abdomen, and the entire body may be wrapped in blankets. As soon as the sickness is overcome the diet should be the same as for ordinary diarrhoea, especially diluted milk, junket, arrow-root, barley water, and the white of eggs.

In the acute stage of dysentery the treatment should be similar to that for diarrhoea. If there is much vomiting all foods should be avoided, except white of egg and lemon-water, barley-water, buttermilk or whey. When vomiting is overcome or absent, the food may consist of milk, junket, custard, thin arrowroot, Benger's food, blancmange, jelly, isinglass and milk, raw eggs, decoction of iceland moss, and other foods having a soothing or non-irritant character. All soups, broths, and meat extracts should be prohibited. Stimulants are usually required in the early stages of the disease, and brandy is probably the best form; later on some red wine, especially whortleberry wine, may be beneficial. Asylum dysentery requires similar treatment.

If diarrhoea occurs during the course of some other disease, such as peritonitis, it is better not to give any food by the mouth for about twenty-four hours. If, however, it seems desirable to give anything at all it should consist of ice and a quarter of a teaspoonful of Valentine's meat juice, or half a spoonful of Brand's essence or Beef Plasmon, in alternation

with albumin-water. When the vomiting ceases, or is absent, we may give in addition a few spoonfuls of junket, custard, jelly, or even milk and citrate of soda every few minutes, and as improvement occurs build up the dietary in the same way as for other forms of diarrhœa.

CHAPTER XV.

INTESTINAL CATARRH.

INTESTINAL catarrh may be acute or chronic and affect a small or large portion of the small intestines or the colon. Acute intestinal catarrh is almost always attended by diarrhoea, is due to the same causes, and requires the same treatment.

Chronic catarrh of the bowels is a serious disease, all the more so because it is seldom recognized and treated before considerable time has elapsed and the consequences have become very marked.

Catarrh of the small intestines is probably far more common than it is usually supposed to be. It is a cause and a consequence of intestinal dyspepsia and auto-intoxication. It results from long-continued irritation of the mucous membrane by improper food, from defects of the nervous system causing a disturbance of the digestive processes, from continued irritation by the products of fermentation and putrefaction, from the direct action of bacteria on the mucous membrane, from portal stasis or abdominal plethora resulting either from intestinal causes, hepatic congestion, or diseases of the heart. There are, therefore, a large number of causes of catarrh of the small bowels. Two types of cases may be given as illustrating the disease.

(a) Young people, chiefly young women who are afflicted by constipation and intestinal dyspepsia. They suffer from cold hands and feet with occasional burning of the same, gastric indigestion from slight causes, and nervous symptoms. The evidences of catarrh are indistinct. There may be excessive secretion of succus entericus and peristaltic movements, causing loud gurgling and rumbling in the abdomen

owing to the mixture of gases and fluids; nevertheless, the patient may be constipated because time is given for the absorption of fluids in the lower bowel; in fact, constipation is the rule. In a few cases the movements of the bowels are accelerated to such an extent as to cause diarrhoea, in which event the faeces may contain undigested food (lienteric diarrhoea) or mucus, and sometimes blood. The presence of an excess of mucus in the bowels hinders absorption of the food, and the patient becomes pale, thin, and debilitated owing to intestinal insufficiency. The flatulence and disturbance of nutrition may be great, the nervous symptoms meanwhile increasing until the patient becomes distinctly neurotic and unfit for active physical or mental work.

(b) The second type is that which occurs in middle-aged or elderly persons. It is usually the result of abdominal plethora and failure of the liver (hepatic insufficiency). It occurs in men as well as women, but especially in the latter. They have got to the age when the preservation of a good figure is of no moment. They find it convenient to loosen their corsets; moreover, it is necessary for them to do so on account of increasing rotundity. They usually have a florid complexion and some excess of fat. They suffer from palpitation and shortness of breath on exertion and frequent attacks of indigestion. Owing to intestinal indigestion their liver is flooded with toxins absorbed from the bowels, and it is unable to deal with all the products of imperfect digestion or bacterial decomposition. Consequently the liver becomes congested, enlarged somewhat, and dams up the blood in the portal veins and the branches from the stomach and bowels. These veins lose their elasticity and gradually become dilated; like varicose veins in the leg, they are always overfull. These overfull veins in turn cause congestion of the veins and capillaries (passive hyperæmia) of the intestinal mucous membrane. The consequence is blood stasis, which acts prejudicially to the mucous membrane in various ways: (a) The intestinal walls do not get sufficient oxygen; (b) in consequence of this the muscles of the intestines, and especially of the villi (those numerous tiny little pumps), become weakened; (c) failure of muscular power in

the intestines means a delay in absorption of the digested food; (*d*) moreover, the intestinal stasis favours bacterial decomposition and toxæmia. As the congested liver is unable to destroy all the toxins brought to it, some of these poisons escape into the general circulation. They find their way into the pulmonary circulation and set up recurrent bronchitis. In time the heart becomes badly nourished, its muscles feeble, its ventricles dilated, and cardiac weakness with a low-tension pulse is added to congestive bronchitis, toxæmia, and increasing bodily debility.

In these cases of catarrh of the small intestines there may be: (*a*) no diarrhoea, a soft pultaceous motion being discharged daily; (*b*) constipation may alternate with diarrhoea in which the stools are soft and contain mucus; or (*c*) there may be continuous diarrhoea, the faeces often being acid, the contents of the small intestines being hurried along to the rectum and discharged with a rapid movement.

TREATMENT OF CATARRH OF THE SMALL INTESTINES.—The diet of people who suffer from intestinal catarrh is of the greatest importance. Everything likely to irritate the mucous membrane should be avoided. All food must be completely masticated, and nothing should be swallowed that is not exceedingly fine and smooth. It is necessary when the case is a very bad one to reduce everything to a pulp before allowing it to be consumed. An average case, however, would be sufficiently protected from irritation by careful selection, preparation, and mastication of the food. The rule of Sir Lauder Brunton for these cases is, "The patient must avoid skins and bones, strings and stones". If this rule is impressed on the memory it will serve as a guide to what the patient may not have and for the preparation of the foods he may have.

What the Patient is to Avoid.—Every particle of skin, gristle, and perceptible fibre should be removed from all kinds of meat, fowl and fish. Scales must be carefully removed from sardines and other fish. The bones of all animals must be religiously avoided. This is not an easy matter with regard to sardines, pilchards, whitebait, sole, and many other fishes. The skins of vegetables and fruit, the

seeds of all kinds of fruit, fibrous vegetables, etc., must all be avoided. An exhibition of the various articles recovered from the faeces will show the necessity for carefulness on the part of everybody, more especially those who suffer from catarrh of the alimentary canal. Among those which have been seen by the writer are pieces of bone and wood varying from $\frac{1}{4}$ to $1\frac{1}{2}$ inches in length, and from the thickness of a pin to that of the finger; the larger pieces were swallowed in stews, entrées, soups, etc.; gristle and undigested skin from meat, etc.; scales from fish; skins of fruit—e.g., plums and grapes, currants; seeds of apples, pears, oranges, currants, gooseberries, strawberries; stones from cherries, damsons, etc.; peas, beans, either skins or undigested legumes; undigested oatmeal, bran, nuts, raisins, currants, salted or dried meat; last, but not least, tin-tacks, buttons, teeth, etc.

What the Patient may have.—Bread two or three days old, bread and butter, plain biscuits, crackers, rusks, sponge cake, madeira cake.

Soups.—Clear or thick, but they must be strained through a sieve. Exception: When diarrhoea is a marked feature of the case all soups and meat extracts should be avoided. “French soup” is particularly good for most cases; this can be made without meat. It is practically a consommé of all kinds of vegetables and herbs, rubbed through a sieve, and finally boiled up with milk and a raw egg or two added. Ordinary clear soup with macaroni or vermicelli is suitable when there is no diarrhoea.

Flesh.—Any kind of meat which has been reduced to a pulp and rubbed through a sieve; scraped raw meat, potted meat, chicken panada or soufflé; eggs—raw, poached, scrambled or buttered, “egg-snow” and custard; a fillet of sole or plaice, half a whiting, or a small amount of fresh haddock. Meat powders, such as Meatox and Mosquera’s beef-meal, are suitable when other forms of meat disagree.

Vegetables.—Any vegetable which has been cooked and reduced to a purée or rubbed through a sieve. In addition to these, the patient may have potato, mashed and creamed; vegetable marrow, boiled lettuce, spinach, and beet-chard. No raw vegetables.

Puddings.—Custard, junket, blancmange, jelly of all kinds, and puddings made from farinaceous materials such as Neave's, Savory and Moore's or Mellin's food. Milk is admissible as a beverage, or in puddings and jellies; milk powders are also useful. Rice, sago, and tapioca puddings are exceedingly suitable, but great care must be taken that every grain of the substance is perfectly soft. Such puddings should be cooked for at least four hours; by this means not only will the softening of the cereals be assured, but some of the starch will become dextrinized.

Fruit.—Raw fruit is usually forbidden, but if the rule of Brunton be observed several kinds can be allowed; thus a few grapes, a ripe banana, and one or two plums may be taken if the skins and seeds are removed. Strawberries, raspberries, currants, and other fruits can be rubbed through a sieve, and the pulp eaten with sugar and cream. Cooked apples and plums may be taken, also stewed rhubarb.

Drink may consist of milk, whey, buttermilk, China tea, cocoa, coffee, Ovaltine, Hygiama food, Café Zylak, etc.

The following recipes may be found useful:—

Vegetable Soup.—Boil a carrot, onion, leek, and half a turnip in three pints of water until they are tender; strain the liquor through a wire sieve and rub the vegetables through; season with salt and pepper. Make a custard of the yolks of two eggs and half a pint of milk. Boil up the soup and pour it on the custard while stirring; finally stir into it the egg-whites, and it is ready to serve. Any vegetables can be used in place of the above, and a small piece of mace, a bay-leaf, a sprig of thyme, or a clove of garlic, a few sorrel leaves, tarragon, or chervil can be used for flavouring.

Carrot Soup.—Slice three carrots and boil them in two pints of veal stock until they are tender. Remove the carrots, rub them through a wire sieve, return them to the soup, boil, season, strain again through the sieve, and add some cream just before serving it. Artichoke soup and turnip soup can be made in the same way; chicken stock can be used instead of veal stock.

Chicken Soup.—Boil a fowl with vegetables until it is

tender. Take out the bird, remove the meat, put the bones back into the soup and continue to boil it with the vegetables and some seasoning. Meanwhile pound the flesh with some boiled rice in a mortar; rub it through a sieve. Pour the soup over it, through the sieve; stir well; finally add two or three ounces of cream and it is ready.

Chestnut Soup.—Take a pound of chestnuts, slit the skins with a knife, and drop them into boiling fat for two or three minutes; and, while hot, remove the outer and inner skins. Put the nuts in a pan with three pints of boiling veal or fowl broth and boil them until they are tender. Take out the chestnuts, pound them in a mortar, or put them through a fine-mincing machine, add a pinch of nutmeg, return them to the soup, boil for one hour, strain through a sieve, and add a cupful of cream. The soup should not be boiled after adding the cream.

Barley or Rice Soup is made by boiling pearl barley or rice in veal or fowl broth until it is quite soft; the grain is then pounded in a mortar, rubbed through a sieve, mixed into the soup, seasoned, and enriched with cream and custard as in vegetable soup.

Chicken Panada.—Take the flesh from half a boiled fowl and reduce it to a pulp in a mortar. Add half as much crumbs of bread, the white of two eggs, two tablespoonsful of cream, pepper and salt. Put this mixture into a buttered dish and steam it three-quarters of an hour. Meanwhile make a sauce of the yolks of two eggs and some stock from the boiled chicken. Turn out the panada and pour the sauce over it.

When making chicken soufflé pounded chicken and bread-crums are seasoned with pepper, salt, and a little nutmeg. Finally the white of two eggs is beaten to a stiff froth and mixed thoroughly into the mass. It is then put into a well-buttered dish and baked in an oven fifteen minutes.

Bavarian Cream.—Make a custard of two eggs and three egg-yolks, three ounces of powdered sugar, and half a pint of milk. Beat up the eggs and yolks with a whisk; while still beating let the milk be gradually added at a boiling temperature. Put the mixture into a saucepan over a slow

fire and continue to stir until the custard is thick enough to coat the spoon. Pour it into a basin until it is quite cold.

Now take half a pint of cream, flavour it with fruit juice and some sugar, and beat it thoroughly with a whisk ; immediately afterwards stir into it half a cupful of milk, and next one ounce of melted gelatine or isinglass. Finally, pour the custard into the cream, thoroughly mix it with the whisk, and pour it into a mould to set.

Blancmange Sponge.—Take two ounces of cornflour, one pint of milk, two eggs, two ounces of sugar, and a teaspoonful of pure butter. Mix the cornflour to a smooth cream with a little milk ; beat up the yolk of the eggs with the sugar, and stir into the cornflour. Boil the rest of the milk in a large saucepan ; remove it from the fire, and gradually pour into it the cornflour mixture while stirring ; add the butter and a little salt. Boil for ten minutes, stirring all the time. Beat up the egg-whites to a stiff froth and stir lightly and evenly through the mixture ; pour it into a mould to cool. It may be eaten with any kind of sauce made from fruit juice.

Fruit-Juice Sauce.—Raspberries, currants, cherries, plums, crab-apples, gooseberries, blackberries, bilberries, whortleberries, rhubarb, and other fresh fruits may be eaten when prepared in this way by sufferers from intestinal catarrh. Take a pound of fresh fruit and half a pound of sugar ; stew them until the fruit is tender ; rub through a sieve ; when cold serve round blancmange, sponge, and other moulds.

Fruit Jellies can be made of cornflour and fruit juice. Take one and a half pints of fruit juice and two and a quarter ounces of cornflour. Mix the flour into a smooth cream with a little juice. Boil the rest of the juice, and while boiling pour it slowly into the cornflour, stirring vigorously. Put the mixture into the saucepan, bring to the boil, continue to boil for three minutes ; pour it into a mould to cool ; serve with cream. The fruit juice must be carefully prepared. Practically any sort can be used—*e.g.*, cherries, currants and raspberries, strawberries and rhubarb, damsons, plums, and apricots ; apples or pears may have a few cran-

berries mixed with them to give flavour. As a general rule a pound of fruit, if not fully ripe, requires half a pound of sugar; when quite ripe perhaps not more than a quarter of a pound of sugar. Wash the fruit, put it into a saucepan with the sugar, and only enough water to cover them. Stew until the fruit is quite soft. Strain through a flannel cloth or fine sieve, pouring over the fruit enough water to make a pint and a half. It is now ready for use. Isinglass or gelatine might be used to form the jelly, but cornflour or arrowroot is more nutritious.

SPRUE OR PSILOSIS.

Sprue is a disease belonging to this group which should have special mention. It is a chronic and insidious catarrh affecting the whole of the alimentary canal. It occurs chiefly in adults who have resided in tropical countries. Its origin is unknown, but it is believed to be due to bacteria. It is a troublesome and serious affection, often lasting for years, producing emaciation and great weakness by the persistent diarrhoea which is its chief feature. For this disease it is sometimes recommended that milk alone should form the diet; it must be taken in a quantity sufficient to support the nutrition of the body—that is to say, not less than four pints and usually five pints daily. There are, however, diversities in the treatment. One authority recommends the addition of strawberries and another medlars to the diet. Manson, who is one of the greatest living authorities on tropical diseases, says milk diet is the best to begin with, but it should not slavishly be adhered to. Thin recommends the consumption of two or three pounds of fresh ripe strawberries a day; Mercier says the consumption of three-quarters of a pound of soft, not over-ripe medlars a day will cure the disease. The patient should be kept in bed until these fruits can be added to the diet. As the stools become normal we may gradually add raw eggs, rice milk, jelly, chicken panada, raw scraped meat, and gradually build up a dietary such as would be given in other cases of intestinal catarrh. Cantlie recommends that the treatment should be begun by a meat diet; he prescribes raw meat juice, plain jelly, and scraped

meat sandwiches, to be given in small quantities every fifteen minutes. As the weakness subsides he makes the intervals of feeding longer and the amount of food greater, until at the end of a week the patient has four or five ounces of beef minced in a machine three times a day. At this time he allows some of the meat to be lightly cooked over a fire. Between the meals he orders jelly, and some rice boiled and steamed until it is dry. After two weeks he allows a slice of tender meat from any joint, underdone roast beef being the best; but beef or mutton, boiled chicken, and light fish are all allowed. "Pulled bread" is allowed after two or three weeks. Boiled celery, boiled lettuce, vegetable marrow, seakale, and spinach are now allowed. Strawberries may be taken between the meals. Some red wine, old port, Hungarian, whortleberry or barberry wine are recommended; and toddy made from the fermented juice of the cocoanut palm; the latter is said to be a specific for chronic diarrhoea, dysentery, and intestinal catarrh.

CATARRH OF THE COLON.

The catarrh may be more or less confined to the colon, or attention may be drawn to the colon because the evidences are more pronounced than in catarrh of the duodenum, jejunum, or ileum. These cases, again, may be divided into two groups—(a) Those in which there is a definite local lesion: (1) Ulcerative colitis, (2) tubercular and syphilitic ulcers, (3) malignant disease; (b) Those in which no definite pathological cause can be found: (1) Mucous colic, (2) mucous colitis, and (3) mucomembranous colitis.

If the affection be due to stricture of the bowels from syphilitic or malignant disease, there will be constipation in the first instance; this is succeeded by diarrhoea and other symptoms of the causative disease. In tubercular ulceration there is nearly always diarrhoea from the first. Belonging to this group is the morning diarrhoea which affects various people. It is usually found that the trouble is due to the presence of an ulcer in the colon, probably in the sigmoid flexure.

Ulcerative colitis is a different matter. It is common in asylums, where it is known as asylum dysentery, and it also occurs among people outside such institutions. The first symptom is abdominal pain, followed by diarrhoea; the act of defaecation is attended by pain, but there is not such a frequent desire to defaecate as in dysentery. The motions are foul, liquid, and dark coloured. They contain blood; but this is not always fresh, it is partly combined with the faeces, partly in clots looking like red-currant jelly. In addition, the faeces may contain pellets of mucus and shreds of mucous membrane. The patient becomes seriously ill, weak, exhausted, and the temperature may rise to 100° or 103° F.—The condition is a dangerous one, and about 50 per cent of cases in asylums die in a month or two after the onset of the disease from severe diarrhoea or profuse haemorrhage.

Mucous colic, mucous colitis, or membranous colitis is always attended by obstinate constipation. The faeces are accompanied by mucus; this may be clear pellucid mucus, like raw white of egg, in pellets or masses sufficient to cover the faeces; the mucus may be in flakes like pieces of boiled white of egg; or it may consist of a membranous cast of the bowels, which is evacuated entire or broken into shreds.

The causes of this condition are unknown or unsettled. In the majority of cases no pathological change of the coats of the bowels can be found, in other cases there is some thickening of the structures due to chronic hyperæmia. The only symptom referable to the bowels is the obstinate constipation, although there may be pain or aching along the course of the colon and tenderness on pressure; and in “mucous colic” violent attacks of pain, due to spasm in the colon, precede the discharge of a large amount of mucus. The prolonged constipation, often lasting for years before the occurrence of mucous or membranous colitis, is said to be the cause of an excessive formation of mucus. We can easily understand that the retention of faeces is a source of irritation to the mucous glands in the coats of the bowels. These crypts, lined with mucous cells, ordinarily provide sufficient mucus to lubricate the passage and keep it moist

—no more! The secretion is a glairy, transparent, viscid fluid, such as may be seen covering scybala and hard motions in an ordinary case of constipation. Constipation causes, first, an excess of ordinary healthy mucus; secondly, it provokes some change in the mucous cells so that the secretion is altered in character from a glairy, transparent fluid to something like a paste, which forms a mucinoid coating to the bowels. But however changed the discharge may be, it is always mucus or mucinoid in character, and never contains fibrin such as would occur from inflammatory exudations. This paste-like substance may be protective in character, but it does not lubricate the bowels or assist in defæcation. The nervous system is always seriously disturbed in this disease, owing to the toxæmia arising from the constipation and intestinal indigestion; so much are the nerves deteriorated that some authorities consider the pathological condition a secretion neurosis. Moreover, the longer the disease lasts the more neurotic becomes the sufferer.

The patients are always chronic dyspeptics, usually eating little, suffering pain after food; they are thin, pale, anæmic. Their mental condition is that of the pessimist; they view everything from the worst side, become gloomy, despondent, and melancholic. They are not always passing "skins" or large quantities of mucus. When their motions are practically free from this material their health is improving; when their health is worse, the despondency more marked, the feebleness pronounced, and the general condition is deteriorating, they are about to pass "skins," or large quantities of mucus; and when they have got rid of them their health is again improved.

Mucous and membranous colitis are sometimes due to the lodgment of a foreign body in the colon. Thus a patient who had suffered from dyspepsia for more than a year, who ate little and suffered from constipation and mucous colitis, was soon cured after the removal of extraneous substances. She was given a diet of bland and unirritating food, such as for intestinal catarrh in general. The constipation was treated daily by large enemata of warm water transformed

into an imitation of Plombières water by the addition of alkalies. This treatment brought about an improvement in the general condition. One day she spontaneously passed some jet beads, the size of a pea, which had been swallowed more than a year previously ; some more beads were passed a few days later ; and from this time forwards the recovery progressed rapidly, and within a short time the patient was apparently completely cured.

The food required by patients suffering from catarrh of the large intestine, mucous or membranous colitis, etc., should be that already given in detail for the treatment of catarrh of the small intestines. There is no necessity to repeat the directions. It is the dietary which must be given at the beginning of the treatment of every case of disease of the colon until we have got a thorough insight into the patient's symptoms and condition. That diet will not cure every case of catarrh of the colon. But there are many cases where any other kind of diet will irritate the mucous membrane and aggravate the disease.

A. The diet for chronic intestinal catarrh should be given continuously when the symptoms of colon disease are complicated by the following conditions :—

(a) In all cases attended by diarrhoea ; (b) in all cases of constipation due to inflammatory or ulcerative processes ; (c) in organic diseases—cancer, tubercle, syphilis, etc. ; (d) spasmotic affections of the colon due to a hypersensitive condition of the mucous membrane ; (e) diseases of the pelvic organs—bladder, uterus, fallopian tubes, ovaries, or painful affections of the rectum and anus.

B. Cases in which the diet should be different from that for intestinal catarrh :—

(a) When diseases of the pelvic organs are absent ; (b) when inflammatory and ulcerative conditions are absent ; (c) when the catarrh is chiefly confined to the appendix and colon ; (d) when the condition is distinctly neurotic—e.g., myxoneurosis or secretion neurosis.

The theory of the neurotic origin of mucous and membranous colitis which is largely accepted is founded on the fact that the disease affects neurotic persons, and an attack

of mucous colic can be brought on in persons subject to it by severe mental emotion, worry, or anxiety. In inflammatory diseases of the colon the discharge of mucus is not so profuse as in mucous colitis, and differs in character from that of the membranous form. The symptoms of the disease occur in a vicious circle ; intestinal dyspepsia is probably the first act, the absorption of toxins from the bowels causes the second act, or debility of the nervous system, whence arises atony of the bowels and constipation ; as the result of constipation there is a greater absorption of albumoses and toxins from the bowels, which still further poisons the nervous system, and the neurasthenia is believed to give rise to the perverted secretion of mucus. The theory of local irritation of the mucous glands by the absorption of toxins, and their effects on the cells in the mucous crypts, producing first a profuse but normal mucus, and later on the change in the character of the discharge which results in the formation of "skins," membranes, or flakes of mucus, is also held by many authorities. The disease is seldom fatal, but it drags through a long period with intermissions. The affection is curable, but very many patients go on for years before the disorder is recognized or properly treated ; the prospect of complete recovery is thereby diminished. About 50 per cent of cases are cured. Men do better than women. If this disease is neglected the patients go from bad to worse, get thinner, paler, more anaemic, and feebler ; they ultimately lie in bed a good deal of their time, being too ill to move. When they are somewhat better they move from place to place in search of health and comfort. Truly their condition is miserable. Few diseases have a wider ramification and produce more serious ill-health than membranous colitis.

These are the cases which are improved by a dietary of a very different character from that of chronic intestinal catarrh. They require a bulky diet, one which contains a good deal of fibre (cellulose), which probably acts upon the mucous membrane by stimulating it, provoking muscular action, and by tending towards a daily action of the bowels, removing the poisons which irritate the mucous glands or

poison the nerves which control them. The first difficulty which faces us is the small appetite of the patient. It is useless to expect these people to take a dinner like a navvy's or like a healthy woman. Cabbage, savoy, cauliflower, turnips, swedes, carrots, and other fibrous vegetables are exceedingly useful in this complaint. But the patient cannot take a sufficient bulk of food to be able to nourish her body with these innutritious foods; besides she has no taste for them and does not appreciate them. They will take fruit and fill their small stomachs with it to the exclusion of everything else. Fruits are useful, but insufficient as a sole diet. They will also eat nuts, and these are a valuable source of protein if the patients can digest them; at any rate, they should be allowed to try them. But it is absolutely necessary that the body should get a sufficient supply of proteins as well as carbohydrates and fat. The following is the dietary I am in the habit of prescribing; it has proved very successful in my hands. It consists of two pints of milk, two or three eggs, half a pound of brown bread, two ounces of butter, and as much vegetables, fruit, and nuts as the patient can eat. With regard to fruit and nuts, some kinds go together better than others. The following combinations appear to me to be the most useful: Apples, walnuts, and figs; pears, hazel nuts, and dates; grapes, Brazil nuts, and figs; bananas, hazel nuts, and figs; blackberries, roasted peanuts, and pears; strawberries, walnuts, and dates; currants or gooseberries, bananas, and Brazil nuts. Dried peas and beans may be taken at the same meal as cabbage, cauliflower, spinach, seakale, boiled lettuce, skirret, or turnips and carrots. Meat will not do the patients any harm, but as a rule they take nuts and fruit better. The kernels of nuts have about the same protein value as meat. They can be ground in a mill and made into an omelette with the eggs. A glassful of milk, two ounces of shelled nuts and plenty of fruit will make a meal large enough for most young ladies. But the food must be varied day by day. Moreover, it is necessary to see these patients eat their food. It is wonderful what tricks neurotics play their nurses and how they dispose of their food without

consuming it. An extended trial of this dietary should be made; it must be carried out carefully and religiously; half measures are worse than useless, for instead of improving the tone of the body and correcting constipation, they would lead to an aggravation of the neurotic condition.

The colon must be evacuated every day, for very little improvement of the general condition will be made until the constipation is improved. As a general rule aperient medicines and pills are useless. But a large dose of castor oil, one ounce or even an ounce and a half, every morning for months together will sometimes do a vast amount of good by removing the irritating cause—viz., the faeces. If this is objected to, the next best thing is lavage of the colon by a large enema every morning. Many patients are sent to Plombières, where this treatment is carried out with the natural mineral water of the place. Water made in imitation of it can be used at home. Boracic lotion and other mild antiseptics may also be used. Hot baths, compresses over the abdomen, massage of the whole body and of the abdomen in particular will materially help in the cure. Various forms of electrical treatment are also useful.

Occupation of the mind and body is essential. The patients should be encouraged to find something congenial to do. They are always worse when they do nothing. Out-of-door exercise is good for them; if they have strength to play tennis, Badminton, croquet, bowls, or golf they should occupy themselves daily in one or other of these games. If they cannot do so, they must be encouraged to walk as far as their strength will allow. It is useless, however, to push these exercises too far; patients soon tire of anything which exhausts them; and if they feel worse after any game, it may be a week or two before they will try it again. Change of place and scenery is good for them; but they must go to a bracing place, such as the Malvern Hills, the mountains of Wales or Switzerland.

When other means fail of curing these diseases of the colon, various operative measures may be resorted to. I have seen cases improved by the formation of an artificial channel through the appendix. This allows of daily irriga-

tion of the entire colon with water or lotion. Finally, there is the operation for removing the colon, which has proved very successful of recent years.

The foregoing dietary is of great value in persons who suffer from tenderness in the region of the appendix but who have never had appendicitis, or from whom the removal of the appendix is unnecessary. The value of the appendix to human beings is unknown. It is an organ of great importance in many of the lower animals. The future may disclose some function of importance to mankind which the appendix performs. At present we can only liken it to an oil-can which pours, drop by drop, a lubricating fluid into the intestinal canal and smooths the passage of the contents of the bowel. This function may be disturbed in various ways. Catarrh of the cæcum may extend to the appendix ; swelling of the mucous membrane may obstruct the passage of the secretion from the appendix ; micro-organisms, always present in the intestine, may at any moment, and in the presence of irritating secretions, transform a mild catarrh of the appendix into an acute inflammation, which may terminate in suppuration, perforation, or mortification of the appendix.

While an attack of appendicitis is in progress absolute rest is necessary, the patient will require no food except milk and barley-water in equal parts, and some ice to suck. The question of removal of the appendix will have to be considered. But it is not advisable to operate during an attack of acute inflammation ; nor is an operation necessary for all cases of appendicitis. The cases which require an operation are those where suppuration has occurred, where there is a suspicion of peritonitis caused by it, and when the patient has had several attacks of appendicitis. In many cases, under the influence of a simple diet, complete rest, and the application of poultices or compresses to the abdomen, the pain and swelling will gradually subside and disappear in fourteen to twenty-one days.

The subsequent treatment of the appendix is the same as for catarrh of the bowels. If intestinal fermentation and putrefaction be prevented, and a free daily evacuation of

the bowel ensured by dietary suited to intestinal dyspepsia and constipation, it is probable that further attacks of appendicitis will be prevented. When the bowel is healthy the free use of vegetables and fruit, even those which contain seeds, is one of the best means of preventing a recurrence of the disease. When intestinal catarrh is in evidence the seeds and skins of fruit must be removed, according to the rule of Brunton; but an abundance of cooked apples, rhubarb, plums, peaches, prunes (and other fruits after removal of the seeds) may be taken. By preventing intestinal stasis, and especially a collection of faeces in the cæcum and ascending colon, the initial symptom of appendicitis will be warded off, and any tendency to inflammation of the appendix may be removed.

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